Imperial Bureau of Plant Breeding and Genetics

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Cambridge
England

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is followed as far as possible and a worked example of an experiment with a missing block and one with a missing treatment are given.
The case of the Youden square is dealt with on similar lines.

BREEDING 575

926. SARUP, S. 575:631.521.6
Breeding of disease resistant crops.
Allahabad Fmr 1940 : **14** : 98–108.
The application of the principles of Mendelism to the breeding of disease resistant crops is considered and examples of the successful production by plant breeders of disease resisting and high yielding varieties are given.

927. BELL, G. D. H. 575:633
Crops and plant breeding.
J.R. Agric. Soc. 1940 : **101** : 1–33.
In this annual survey for farmers the topics dealt with are grassland, wheat, barley, oats, potatoes, sugar beet, leguminous crops, *Brassica* crops, variety trials with sugar beet, wheat, oats, barley and potatoes, seed disinfection, watering, irrigation and phasic development.

928. 575:633
HUTCHINSON, J. B. 633.51:575
The application of genetics to plant breeding. I. The genetic interpretation of plant breeding problems.
J. Genet. 1940 : **40** : 271–82.
The author bases his discussion on the two problems: variability and the choice of materials in which to select and the improvement of the efficiency of selection. Most of the examples given are drawn from cotton breeding work.
He points out that "natural" selection in crops does not establish a uniform type but rather an equilibrium mixture of types. For the breeder this raises the question of how important it is to achieve uniformity by selection and also implies that the cultivator's fields provide a rich source of variability for selection. This is especially the case in the place of origin of a crop. The use of hybridization to provide variability becomes more important outside the areas of high variability. Advances in our knowledge of the genetic basis of species differences are important in this respect; in species crosses, e.g. between *Gossypium herbaceum* and *G. arboreum* or *G. hirsutum* and *G. barbadense* the genetic balance is broken down by segregation and from the breeding point of view the results are unsatisfactory. This can be avoided, however, by the use of the back-cross.
Research is needed on the effect of selection for one character on the other characters of the plant. The efficiency of selection can be markedly improved by refinement of the progeny test, especially by randomized replication. More research is needed on the rate and magnitude of the changes that can be brought about by selection.

929. 575:633(54.5)
Extract from an address delivered by H. R. Stewart, Esquire, C.I.E., I.A.S., Director of Agriculture, Punjab, at the Rotary Club, on "Thirty years of Punjab Agriculture".
Seas. Notes Punjab Agric. Dep. 1940 : **18** : 1–9.
The topics dealt with include breeding work with wheat, Punjab–American cotton and blight resistant gram. From a collection of 500 varieties of gram three highly resistant types were found and one of these, F.8, has been made the basis of a blight-resistant variety which will be distributed next year.

930. SWAINE, J. M. 575:633(71)
Presidential address. Scientific research, the key to progress in agriculture.
Trans. Roy. Soc. Can. 1939 : **33** : 3rd Ser.: Sect. V : Pp. 18.
This presidential address includes an account of some plant breeding achievements of special importance for Canada and also an account of the organization of Canadian agricultural research.

931. PANSE, V. G. 575–18:519.24

A statistical study of quantitative inheritance.

Ann. Eugen., Camb. 1940 : **10** : 76–105.

The application of the moment generating function of Cornish and Fisher to the statistical analysis of quantitative inheritance is described in detail. It is shown how the relations of statistical properties of the F_3 generation to those of the F_2 may be determined when various assumptions are made about the nature of the genes controlling the character under consideration. Moment generating functions may also be used to follow the effects of selection in F_2 on the characteristics of F_3. The variates used were the F_2 phenotypic value, and the mean and variance of F_3.

The specific examples which are considered are based on the results of staple-length measurements in certain Indian cotton crosses. It was found that these data indicated the presence of three genes, hypothetically with equal variance and without linkage. Five genetical models conforming to this condition were set up. Some involved dominance while some did not, and some involved more than three factors with unequal variances. The F_3s from normal and selected F_2s for each model were calculated and compared.

The method, though mathematically very heavy, should prove to be of considerable value in the analysis of selection experiments where certain initial assumptions hold true. Of these the one most likely to be wrong is that all available genetical variation is already present in F_2, and that there is no potential variation which will be released in a later generation.

K. M.

932. SINGH, M. P. 575.42:633

Crop improvement by selection.

Allahabad Fmr 1940 : **14** : 117–27.

The problems of crop improvement by artificial selection are considered. It is pointed out that it was Johannsen who first discovered and demonstrated the part played by selection in the evolution of better types from a population. However, more recent work shows that the production of a pure line may be an impossibility in at least some crops and that selection continues to be effective for a very long time. It is suggested that the best time to stop selection in breeding work and to proceed to bulk the material for field trials is when the genetic variance has fallen low. Cross-fertilized plants present a much harder problem than self-fertilized ones. In some crops another difficulty has been found; the fittest population is not the fittest type but a mixture of several types made fittest by the process of natural selection.

MICROSCOPIC TECHNIQUE 578.6

933. SAMPATH, S. 578.6

A modified form of acetocarmine.

Curr. Sci. 1940 : **9** : 229–30.

The keeping qualities of aceto-carmine under tropical conditions are improved by the addition of Igepon T, an emulsifier and wetting agent used in dyeing textiles.

PLANT DISEASES AND PESTS 632

934. THORPE, H. C. 632.951.1:575(67.62)

Pyrethrum breeding.

E. Afr. Agric. J. 1940 : **5** : 479–80.

Concluding the article reviewed in "Plant Breeding Abstracts", Vol. X, Abst. 594, the extension of breeding work to the stage of supplying improved material to the farmers is discussed.

One method is multiplication by division; since pyrethrum is self-incompatible it will be necessary to plant more than one clone to ensure adequate development of achenes, in which the pyrethrins occur. Another method is to establish a nursery of high-content lines where seed is raised for distribution to farmers. Both methods are being tried in Kenya and material is to be available for distribution in limited quantities in 1940.

CEREALS 633.1

935. NEWMAN, L. H. 633.1(71)

The best varieties of grain.

Fmrs' Bull. 96, Dep. Agric. Canada 1940 : Publ. 701 : Pp. 13.

Brief notes are given on varieties of spring wheat, durum wheat, winter wheat, oats, barley, buckwheat, linseed, field peas and field beans, including some recently released varieties.

936. WENHOLZ, H., PRIDHAM, J. T., VEARS, C. K. and CURTEIS, W. M. 633.11:575:007(94)
Wheat varieties in Australia.
Agric. Gaz. N.S.W. 1940 : **51** : 195–98, 242–44, 312–14, 347.
Continuing this serial article (cf. "Plant Breeding Abstracts", Vol. X, Absts 272 and 602) brief notes are given on varieties in alphabetical order, from Hard Federation to Lott's. The following recent productions are mentioned: Hofed, a rust-resistant variety giving flour of good baking quality, from a cross made in 1926 by W. L. Waterhouse between Hope and Federation, named in 1937 and released in 1938; Koala, from a cross between Hard Federation and Nabawa made at Wagga Experiment Farm, N.S.W. in 1928, named in 1936, resistant to flagsmut, early, giving flour of medium quality.

937. WATKINS, A. E. and ELLERTON, S. 633.11:575.11:581.46
Variation and genetics of the awn in *Triticum*.
J. Genet. 1940 : **40** : 243–70.
The different types of awns in wheat are described and the results of other workers on their inheritance reviewed.
On the basis of their own and other studies the authors postulate the following factors: B_1, producing the condition known as "tipped 1", in which only a few awn tips up to 1 or 2 cm. occur, the longest tips being found near the top of the ear; b_1 is the recessive gene for bearded and b_1^a is another allelomorph of this series producing "half-awned" types with short awns. B_2, producing the condition called "tipped 2", in which the awns are reduced to a few short tips, usually of about equal length from top to bottom of the ear; b_2 produces bearded and in progenies segregating for B_2 and b_2 there was usually a deficiency of b_2b_2 types. *A*, another gene for the half-awned condition may be an allelomorph of b_2, but this is not yet established. *Hd* (hooded) reduces the length of the awns and generally makes them curved and twisted near the base. Its effect is strongest in late tillers.
Among the combinations possible are the following: bearded, $b_1b_1b_2b_2hdhd$; tipped 1, $B_1B_1b_2b_2hdhd$; tipped 2, $b_1b_1B_2B_2hdhd$; hooded, $b_1b_1b_2b_2HdHd$; beardless, $B_1B_1B_2B_2hdhd$; hooded beardless, $B_1B_1B_2B_2HdHd$.
It is not yet known whether the factor for hooded found in Abyssinian tetraploid wheats is the same as *Hd* of *T. vulgare*. B_1 is linked with the genes for pubescent node, squareheadedness and keeled glumes. B_1, B_2 and *Hd* can be transferred to tetraploid wheats and there segregate regularly.
Awn length is also affected by chromosome number, by modifying factors and by factors whose main effect is on some other character.

938. PETO, F. H. and BOYES, J. W. 633.11:575.127.5:576.356.5:581.04 633.11:575.127.5:633.289
Hybridization of *Triticum* and *Agropyron*. VI. Induced fertility in vernal emmer x *A. glaucum*.
Canad. J. Res. 1940 : **18** : Sect. C : 230–39.
Hybrid seed of several *Triticum* x *Agropyron glaucum* crosses was treated with colchicine. Macroscopic signs of chromosome doubling were observed in several plants so obtained and microscopic examination revealed patches of tissue with larger stoma guard cells. The increase in size of the cells varied in different hybrids and it appeared that in those hybrids in which the increase was greatest, the tissue with doubled chromosomes was best able to compete with undoubled tissue.
None of the plants with external signs of chromosome doubling produced fertile spikes but a plant of the cross Vernal emmer x *A. glaucum* produced one fertile spike out of nine. The chromosome numbers of 11 plants grown from seed produced on this spike were determined: eight had $2n = 70$ and the others had 64, 68 and 69. The undoubled F_1 hybrid had $2n = 35$. The amphidiploids are vigorous, leafy and fertile. At meiosis there were 27 to 31 bivalents, 6 to 9 univalents and occasional trivalents and quadrivalents. The anthers dehisced and produced abundant pollen of which 94% was good. The undoubled F_1 produced only about six bivalents and its anthers were unable to dehisce, containing only about 2% good pollen.

939. WATERHOUSE, W. L. 633.11:575.127.5:633.14
A note on crossing wheat and rye.
Aust. J. Sci. 1939 : **2** : p. 63.

By using the Western Australian wheat variety Geeralying as seed parent unusually high sets, sometimes over 70%, have been obtained from wheat-rye crosses. The method of crossing was to pollinate twice, first when the stigmata were judged to be receptive and again two days later.

940. MEHTA, K. C. and
PAL, B. P. 633.11–2.452–1.521.6:575(54)
Rust-resistant wheats for India.
Nature, Lond. 1940 : **146** : p. 98.

A *Triticum vulgare* variety E.144, introduced from Kenya, has proved highly resistant to races 15 and 40 of black rust and should greatly simplify breeding for resistance to black rust in India.

941. 633.11–2.452–1.521.6:575.11
WADDELL, W. H. 633.11:581.48:575.11.061.6
A study of the relation between the seedling and mature-plant reaction to *Puccinia graminis tritici* in durum wheat crosses involving Iumillo.
Canad. J. Res. 1940 : **18** : Sect. C : 258–72.

Using mainly F_3 progenies, the relation between seedling reaction to *Puccinia graminis* race 21 in the greenhouse and mature plant reaction in the field to a mixture of races was studied in the crosses Iumillo x Mindum "A", Iumillo x Mindum B and Pentad x Iumillo. All lines that were resistant in the greenhouse were resistant in the field and many lines were susceptible in both; a third group was susceptible in the greenhouse and resistant in the field, but in general increasing susceptibility in the greenhouse was accompanied by increasing susceptibility in the field. It is believed that most of the lines highly resistant in the field could have been selected on the basis of greenhouse tests alone.

No simple Mendelian scheme could be advanced to explain the inheritance of rust resistance, but the high variability of lines with intermediate reaction indicated that the number of factors involved was not unduly large and there did not appear to be any great difficulty in recovering the high resistance of Iumillo. In the Iumillo x Mindum crosses Iumillo probably contributed factors both for seedling and mature plant resistance while in the cross Pentad x Iumillo Pentad also probably contributed factors for mature plant resistance.

Segregation for seed colour in the cross Iumillo x Mindum gave an F_2 ratio of 3 red: 1 white. Seed colour in the F_2 was not related to rust reaction in F_3.

OATS 633.13

942. 633.13.00.14(71)
Oat variety trials on the Dominion Experimental Farms 1939.
Rep. Cereal Division, Cent. Exp. Fm, Ottawa, Ont. 1940 : No. 39 : Pp. 32.

Report on oat co-operative rod row tests and supplementary rod row tests.
Rep. Dominion Rust Res. Lab., Winnipeg 1940 : No. 39 : Pp. 11.

The yield per acre, days to mature, length and strength of straw, weight per bushel and percentage hull of a number of oat varieties grown at several experimental farms are given in a series of tables in the first report. In the second report similar data are given for the rod row tests carried out at several stations. Notes on the strains and crosses grown are also given. The strains from the cross Victoria x No. 524 are resistant to stem rust, crown rust and smut. Other strains are resistant to stem rust only.

BARLEY 633.16

943. 633.16:575(41.5)
The history of malting barley in Ireland.
B.G.A. Rec. 1940 : No. 4 : 7–8.

This is an account of the work on barley variety testing, selection and breeding which has been conducted in Ireland during the present century, work which culminated in the variety Spratt-Archer. This is still the best type available although new hybrid selections are being continually tested against it.

MILLETS AND SORGHUM 633.17

944. RANGASWAMI AYYANGAR, G. N. and VENKATARAMANA REDDY, T. 633.174:581.46:575.11.061.6

The inheritance of a new type of purple pigmentation manifesting on the glumes at anthesis.

Curr. Sci. 1940 : **9** : 228–29.

In the group *Sorghum conspicuum* Snowden a type of glume pigmentation is found in which the glumes emerge green and develop a light purple pigment at the time of flowering. After flowering the purple fades away, though it may be succeeded by the purple characteristic of the dough stage of the grain.

Segregation in the F_2 and F_3 of a natural cross showed the new type of glume pigmentation to be governed by a single recessive factor.

945. RANGASWAMI AYYANGAR, G. N. and VENKATARAMANA REDDY, T. 633.174:581.49:575.11.061.6

The occurrence and inheritance of purple hairs on the spikelets of sorghum.

Curr. Sci. 1940 : **9** : p. 229.

The distribution of hairs on the spikelets of sorghum is briefly described. These hairs may be purple or hyaline and the segregation in F_2 and F_3 of a natural cross showed that purple pigmented hairs are controlled by a single dominant factor.

ROOTS AND TUBERS 633.4

946. 633.491:575(94)

Australia's potato growing industry.

Agric. Gaz. N.S.W. 1940 : **51** : 264–68, 295–96.

After reviewing the conditions of potato cultivation in Australia, this summary of a report on Australian potato problems stresses the need for more concerted activity in potato breeding. The wealth of initial material afforded by the South American potatoes is mentioned and the general outlines of a breeding programme are briefly sketched. The only systematic potato breeding in Australia at present is that done by the New South Wales Department of Agriculture.

947. 633.491–2.8–1.521.6:575

The Scottish Plant Breeding Station, Craigs House, Corstorphine, Edinburgh.

Trans. Highl. Agric. Soc. Scot. 1940 : **52** : Ser. 5 : 121–23.

An account is given of the potato virus research work conducted at the station. An examination of several thousand seedlings from virus-diseased potato plants has shown that the viruses are not transmitted from parent to offspring through the seed. Varieties resistant to the Y virus have been found and resistance to leaf roll of a very high degree has also been found in two obscure non-commercial varieties and in their first generation seedlings. Varieties which are hypersensitive to viruses X, A, B or C, are very valuable since they are field immune to these viruses.

FIBRES 633.5

948. 633.51:575(54)
633.51–1.531.12(54)
633.51:575.1

Summary proceedings of the fortieth meeting of the Indian Central Cotton Committee, Bombay, held on the 3rd and 4th August, 1939. Pp. 62.

Summary proceedings of the forty-first meeting of the Indian Central Cotton Committee, Bombay, held on the 19th and 20th January, 1940. Pp. 59.

Annual report of the Indian Central Cotton Committee, for the year ending 31st August, 1939. Bombay. Pp. 191.

These three reports summarize the various activities, such as plant breeding (both by selection and hybridization), the testing of improved varieties and the distribution of pure seed, in which the Committee has an interest. The work is mostly carried out at stations in the

several important cotton-growing provinces and states. In addition, the third report describes the fundamental work done at the Institute of Plant Industry, Indore. The fundamental genetical work includes the discovery of a new member of the anthocyanin allelomorphic series, cytological evidence showing that the sterility gene in the Million Dollar mutation causes partial asynapsis, a description of preliminary cytogenetical studies on interspecific hybrids and finally a short note on studies of the genetical variability of agricultural characters in intraspecific crosses.

949. 633.51:575(54.7)
633.51:575.127.2:576.356.5:581.04

Cotton breeding at Surat.
Indian Fmg 1940 : **1** : 234–35.

Attempts to introduce American cottons met with no success and were dropped in 1920. By selection in indigenous crops the type known as Selection 1A Long Boll was produced. It is superior to the Surtee Local in yield of seed cotton, ginning percentage and quality. From a cross made in 1901 between Kumpta and Goghari cottons the strain 1027 ALF was selected in 1910–11; the present standard type 1027 ALF is a pure line from a selection made in 1917–18, distribution of which started in 1923. It has a longer staple than Selection 1A Long Boll, a silky feel, a spinning capacity of 30s to 35s highest standard warp counts; its ginning percentage is 3 or 4% below 1A Long Boll but slightly higher than Surtee Local. It occupies about 40% of the cotton area of South Gujarat and further work is directed towards improving its ginning percentage. Segregate 8–1 from the cross 1A Long Boll x 1027 ALF gins about 3% higher than 1027 ALF and has equally long fibre, though it is rather less silky. Another selection, 9–1–4, which is in the purification stage has 2% higher ginning than 1027 ALF with similar fibre qualities.
Selection for wilt resistance is carried on at Shera.
Large-scale hybridization between Old and New World cottons was carried out in 1934–39 and some fertile back-cross hybrids have been obtained by using New World cottons as pollen parents on the F_1. Selections are being made with the object of combining the adaptability and disease resistance of Asiatic cottons with the superior fibre qualities of New World cottons. Encouraging results have been obtained from attempts to produce fertility in F_1 hybrids of Old and New World cottons by using colchicine to double the chromosomes.

950. Panse, V. G. 633.51:575.11–18

Application of genetics to plant breeding. II. The inheritance of quantitive characters and plant breeding.
J. Genet. 1940 : **40** : 283–302.

The material for this investigation was three cotton crosses which were carried on as far as F_3. Staple length measurements were made on the F_2 and F_3 progenies grown in a randomized block trial. Both genetical and environmental variation of the character were observed in these generations. These types of variation were analysed by means of the multiple regression technique, the dependent variate being F_3 staple length and the independent variates F_2 staple length and mean plot value. It is shown that selection is most effective when based on the excess of the individual over the plot mean. The regression analysis also provides an estimate of the relative magnitude of heritable and non-heritable components of the variance.
It is shown that the results obtained could be formally attributed to the segregation of three "effective" factors, hypothetically with equal variance and independent in inheritance. A number of genetical models, some involving dominance, others not, and comprising various numbers of unlinked genes, were so constructed as to satisfy this criterion. By means of moment-generating functions the effects of selection on the various model types were investigated. Selection was found to be more effective in raising the mean and lowering the variance in the absence of dominance and with a small number of genes segregating. It is pointed out that the degree of dominance and the number of genes might be estimated in this way, though no attempt is made to apply the model results to the cotton data discussed earlier.
Part of the discussion of the effects of linkage on the variance of F_3 progenies is vitiated by an error in the calculations. This does not, however, affect the general argument to any appreciable extent. K. M.

951. KHUSHI MOHAMMAD. 633.61:575(54)

A new early ripening variety of sugarcane Co. 396.

Seas. Notes Punjab Agric. Dep. 1940 : **18** : 40–42.

The early variety Co.396 can be planted in March and harvested for gur making in October, giving a better quality of gur than other varieties. It is slightly thicker than the indigenous cane (Katha), does not suffer from frost and is resistant to pyrilla.

952. MCINTOSH, A. E. S. 633.61:575(72.92)

Notes on new sugar cane seedlings at present in Jamaica.

Jamaican Ass. Sug. Tech. 1938 : **2** : No. 2 : 2–7.

New varieties sent to Jamaica from the B.W.I. Central Sugar Cane Breeding Station fall into three groups.

Group I consists of noble varieties which have been tested in Barbados and are considered to be suitable for good soil areas where mosaic disease can be effectively controlled. Notes are given in the present article on the commercial characters of B.2935 (Ba.11569 x Ba.6032), B.3013 (Ba.11569 x unknown male parent), B.3124 (Ba.11569 x B.417), B.3234 (Ba.11569 x B.H.10/12) and B.3439 (Ba.11569 x ♀.813).

Varieties in Group II are intended for good soil areas where mosaic cannot be controlled and resistant varieties are essential. The varieties sent had not been tested at Barbados but their parentage was such that mosaic resistance was likely to be found amongst them, derived from *S. spontaneum* or *S. sinense*. Of the seven sent, three have remained free from mosaic at Hope Gardens, Jamaica.

The third Group contains hardy seedlings suitable for poor soil areas; they are B.34104 (Co.281 x B.H.10/12), B.34117 (P.O.J.2725 x Co.281), B.3337 [(P.O.J.2364 x B.391) selfed], B.35245 (Ba.11569 x P.O.J.234), B.35197 (Toledo x S.C.12/4), B.35214 (Co.213 x B.H.10/12).

953. MCINTOSH, A. E. S. 633.61:575(72.98)

Sixth Annual Report of the British West Indies Central Sugar Cane Breeding Station, Barbados, for the year ending September 30, 1939 :

Pp. 39.

Nearly the whole of this annual report is identical with an article already abstracted (cf. "Plant Breeding Abstracts", Vol. X, Abst. 634).

954. INNES, R. F. 633.61–1.421

Simple methods of field experimentation for the investigation of sugar cane problems.

Jamaican Ass. Sug. Tech. 1939 : **3** : 30–46.

A simple and brief account of experimental design, intended for estate managers and farmers.

955. MCMARTIN, A. 633.61–1.524(68.4)
633.61–2.8–1.521.6:575

The sugar cane varieties of Natal.

Proc. 14th Annu. Congr. S. Afr. Sug. Tech. Ass. Durban 2nd–4th April, 1940 : 33–38.

An account is given of the sugar cane varieties which have been introduced into Natal and succeeded in establishing themselves for a time at least as commercial varieties. Only one variety, Uba, which is immune to mosaic, finally established itself but unfortunately this variety is susceptible to the other major virus disease found in Natal, streak. Suggestions are made as to how to obtain hybrids that are immune to mosaic and streak, using as parents *S. officinarum, spontaneum, Barberi* and *sinense*. It is concluded that varieties of complex hybrid constitution have the best chance of survival. In an appendix, lists are given of the varieties growing at the experiment station and there are also notes on some of the newer varieties under trial.

956. 633.61–1.557(68.4)

Sixth Progress Report on experiments at Umfolozi.

Proc. 14th Annu. Congr. S. Afr. Sug. Tech. Ass. Durban 2nd–4th April, 1940 : 52–55.

P.O.J.2725 has proved to be a very good cane on the flats, but is prone to form tassels when it is one year old or less. In trials it is found that the fourth ratoon crop from P.O.J.2725

is below that from Co.290, Co.281 and P.O.J.2878, but in total value of the five crops from first cane to fourth ratoon P.O.J.2725 still gives the best returns.

957. LINTNER, J. L. and MARITZ, S. M. 633.61–1.557:578.087
A description of apparatus for weighing cane on experimental plots.
Proc. 14th Annu. Congr. S. Afr. Sug. Tech. Ass. Durban 2nd–4th April, 1940 : 48–51.

The design and use of a cheap, portable weighing jib, which has proved very useful for field experiments with sugar cane, are described.

958. 633.61–2.8–1.521.6
BRANDES, E. W. 633.63–2.484–1.521.6
Research on sugar plants and some practical adaptations.
S. Afr. Sug. J. 1940 : **24** : 307–13.

This address to the American Society of Sugar Beet Technologists reviews the practical benefits to the sugar industry from American work on disease resistant varieties of sugar cane and sugar beet.

959. 633.63:575(41)
Seed breeding and seed production.
Sug. Beet Manual, Lond. [1940] : Chapter XIII : 60–62.

In this survey of the methods of handling and the cultivation needed for the sugar beet crop in Great Britain, it is recognized that foreign bred varieties may not be adapted to British conditions of growth. The methods of selection and the production of élite and commercial seeds are briefly mentioned.

960. S....., H. H. 633.682–2.8–1.521.6:575(67.6)
Cassava research.
E. Afr. Agric. J. 1940 : **5** : 401–03.

In this editorial note on work on mosaic disease the breeding of resistant varieties at Amani is mentioned. The work includes introduction from West Africa and from outside Africa and also the breeding of seedlings by controlled pollinations, including interspecific hybridization.

STIMULANTS 633.7

961. PRATT, A. M. 633.73:575(67.62)
Coffee team services.
Progress report on the cultural work at the Scott Agricultural Laboratories.
Mon. Bull. Coffee Bd Kenya 1940 : **6** : 73–76.

Among the lines of work mentioned are variety trials and selection work. Individual tree recording was started three years ago with 40 trees of which 13 now remain; of these 4 are characterized by drought resistance and the remainder by consistently well shaped beans and good liquoring qualities. Similar work is being carried on with 100 trees in a plot of Jackson's coffee grown on the multiple stem system, with 25 trees in an experiment laid out to compare the variability of material propagated by open-pollinated seed, by selfed seed, by cuttings and by grafts on seedling and clonal stocks and finally with 30 Amani selections.

962. GILLETT, S. 633.73–2–1.521.6:575
Coffee team services.
Progress report on the cultural work.
Mon. Bull. Coffee Bd Kenya 1940 : **6** : 56–57, 59.

It is mentioned that a number of trees throughout the country are being recorded individually because of their outstanding vigour and others because of their resistance to disease. Several trees showing resistance to leaf disease (*Hemileia vastatrix*) have been found and have transmitted this resistance both vegetatively and through their seed. Other trees resistant to coffee berry disease (*Colletotrichum coffeanum*) and to Elgon die-back are also being studied.

963. POUND, F. J. 633.74–2.472.3–1.521.6:575(72.98)
Search for resistance to witchbroom in cocoa.
Proc. Agric. Soc. Trin. Tob. 1940 : **40** : 35–37.

A brief account of the expedition referred to in "Plant Breeding Abstracts", Vol. IX, Abst. 77,

and of the progress of the plants grown from seeds collected in Ecuador and the Amazon basin.

964. COMRIE, A. A. D. 633.79:578.08:575.12
Colorimetric determination of the preservative value of hops: standard colour values of some hybrid hops.
J. Inst. Brew. 1940 : **46** : 255–56.

The standard colour values of six hybrid hops raised by Professor Salmon at Wye College were above those for ordinary English varieties. This, however, is probably not due to the influence of the species *Humulus americanus* in the interspecific hybrids. In making colorimetric determinations of the preservative value of these hops a standard colour value of 94 gave results comparable with those obtained gravimetrically.

AROMATIC PLANTS 633.8

965. 633.842:575.24
Mutation in chilli.
Indian Fmg 1940 : **1** : p. 178.

A mutant of the chilli strain I.P. Type 46A has much shortened internodes, the fruit size, shape and bearing being similar to those of the parent. It was discovered at the Imperial Agricultural Research Institute, New Delhi by R. B. Deshpande and its inheritance is being studied.

MEDICINAL PLANTS 633.88

966. JACOB, K. T. 633.88:576.312.35
Chromosome numbers and the relationship between satellites and nucleoli in *Cassia* and certain other Leguminosae.
Ann. Bot., Lond. 1940 : **4** : 201–26.

The chromosome numbers of several shrubs, small trees and one climber are reported. In *Cassia auriculata* L. the somatic number is 14; one more vigorous plant, however, was found to have $2n = 16$. The following six species of *Cassia*—*C. Tora* L., *javanica* L., *grandis* L., *floribunda* Cav., *siamea* Lam., and *corymbosa* Lam.—were all found to have $2n = 28$. Three other numbers are also reported—*Caesalpina pulcherrima* Swartz, $2n = 24$; *Poinciana regia* (Boj) Hook., $2n = 28$; and *Clitoria ternata* L., $2n = 16$.

RUBBER PLANTS 633.91

967. FORD, C. E. 633.912:575(54.8)
Ceylon clones VIII (1939).
Quart. Circ. Ceylon Rubb. Res. Scheme 1940 : **17** : 1–13.

This article is a further report of the test tapping of Ceylon rubber clones (cf. "Plant Breeding Abstracts", Vol. X, Abst. 56). Bark renewal measurement data for the three highest yielding clones, Millakande 3/2, Wagga 6278, and Hillcroft 28, are given for the first time.

968. SHARP, C. C. T. 633.912–1.557:575(91)
Progress of breeding investigations with *Hevea brasiliensis*. The Pilmoor crosses 1928-1931 series.
J. Rubb. Res. Inst. Malaya 1940 : **10** : 34–66.

Families of legitimate seedlings (both parents known) and illegitimate seedlings (female parent only known) from the Pilmoor, Lunderston and Glenshiel clones have been compared for yield and girth records with unselected seedlings. The best families of legitimate seedlings are greatly superior in yield to unselected seedlings and somewhat superior to the best illegitimate families. However the best legitimate seedlings have not been shown to be superior to the best proved clones. Clones have been established from some of the legitimate seedlings and their yields are given.

SMALL BUSH FRUITS 634.7

969. CRANE, M. B. 634.71:581.163
Reproductive versatility in *Rubus*. I. Morphology and inheritance.
J. Genet. 1940 : **40** : 109–18.

THOMAS, P. T.
Reproductive versatility in *Rubus*. II. The chromosomes and development.
J. Genet. 1940 : **40** : 119–28.

While diploid *Rubus* (e.g. *R. rusticanus*) reproduce sexually, different degrees of apomixis

are found in the different polyploid species. Thus *R. Borreri* ($2n = 6x = 42$), *R. nititioides* ($2n = 4x = 28$) and *R. thyrsiger* ($2n = 4x = 28$) are largely aposporous, the tetraploid John Innes berry (RT4, *R. rusticanus* x *R. thyrsiger*) and the loganberry ($2n = 6x = 42$) are mainly reproduced in the normal sexual manner. An intermediate position is occupied by *R. vitifolius* ($2n = 8x = 56$) which produces all its progeny sexually when crossed with diploid *R. Idaeus*, but only 66% sexually if crossed with tetraploid *R. Idaeus*. The transition from apomixis to normal sexual reproduction is correlated with a transition from a high degree of autopolyploidy to allopolyploidy. *R. Borreri*, *R. nititioides* and *R. thyrsiger* are autopolyploids, the John Innes berry and the loganberry are allopolyploids, while *R. vitifolius* is considered to be a doubled allotetraploid.

Embryological studies showed that apospory was the most frequent form of apomixis, but other abnormalities occurred, notably within the sexual embryo sacs and these may be responsible for the segregation which sometimes occurred in apomictically produced progenies.

A classification of different types of apo- and amphimixis is proposed and the significance of these modified breeding systems in connexion with the difficult taxonomy of *Rubus* is pointed out.

970. 634.71:575.127.2:576.356.5

CRANE, M. B. 634.715

The origin of new forms in *Rubus*. II. The loganberry, *R. loganobaccus* Bailey.

J. Genet. 1940 : **40** : 129–40.

THOMAS, P. T.

The origin of new forms in *Rubus*. III. The chromosome constitution of *R. loganobaccus* Bailey, its parents and derivatives.

J. Genet. 1940 : **40** : 141–56.

Though Judge J. H. Logan, who raised the loganberry from an open-pollinated seed of the Californian *Rubus vitifolius* (*R. ursinus*), considered it to be a cross between that species and the raspberry (*R. Idaeus*) other workers (e.g. see "Plant Breeding Abstracts", Vol. IV, Abst. 488) have suggested that it is not of hybrid origin. M. B. Crane has carried out a series of crosses, designed to throw light on this question, between *R. vitifolius*, diploid and tetraploid raspberries and the loganberry. *R. vitifolius* is an octoploid ($2n = 56$), is dioecious and has ternate leaves. The loganberry is hexaploid, with hermaphrodite flowers and 5-pinnate leaves, like the raspberry. The cross *R. vitifolius* x *R. Idaeus* ($4x$) gave hexaploid seedlings which were hermaphrodite, had 5 pinnate leaves and on selfing gave no more segregation than does the loganberry. It is concluded that the loganberry arose as Judge Logan suggested. Since the raspberry variety which acted as male parent was probably a diploid, the loganberry must have arisen by the functioning of a diploid male gamete.

The breeding results obtained suggest that in *R. vitifolius* the pistillate plants are heterogametic.

P. T. Thomas describes the pairing relations of the chromosomes at meiosis in *R. vitifolius* and its hybrids with diploid and tetraploid raspberries, in the diploid and tetraploid raspberries themselves, in the loganberry and in its hybrids with *R. vitifolius*, diploid raspberry and the diploid species *R. neglectus* and *R. niveus*. It is shown that the results can be explained on the hypothesis that the eight chromosome sets of *R. vitifolius* are made up of two groups of 4 similar sets, $v_1v_1v_1v_1v_2v_2v_2v_2$, that the tetraploid raspberry is autotetraploid, *iiii* and that the chromosome formula of the loganberry is $v_1v_1v_2v_2ii$, that is, the same as the hybrid *R. vitifolius* x *R. Idaeus* ($4x$). There is evidence too that the *Idaeus* set *i* is sufficiently homologous with one of the *vitifolius* sets v_1 or v_2 to pair with it to some extent.

The relatively true breeding behaviour of the loganberry on selfing has been cited as an argument against its hybrid origin, but is now seen to be due to the fact that the gametes which produced it were not haploid.

971. HICKMAN, C. J. 634.75–2.411.4–1.521.6

The red core root disease of the strawberry caused by *Phytophthora Fragariae* n.sp.

J. Pomol. 1940 : **18** : 89–118.

The red core root disease of the strawberry has now been found in the south and south-west of England, as well as in Scotland where it was recognized several years ago. The symptoms

of the disease are described and the causal fungus, *Phytophthora Fragariae* n.sp., has been isolated for the first time. Attack on the plant by the fungus depends upon soil conditions. The varieties Pillnitz, Early Cambridge and Oberschlesien are fairly resistant and four new seedling varieties bred in Scotland were found to be immune to the disease.

FORESTRY 634.9

972. SPRAGUE, T. A. 634.972.3:576.356.5

A triploid aspen—*Populus tremula*—from Sweden.

Proc. Linn. Soc. Lond. 1940 : **152** : 111–13. (Abst.).

The substance of this paper has already been reviewed in "Plant Breeding Abstracts" (cf. Vol. VIII, Absts 655, 1311 and 1345, and Vol. X, Absts 882–884).

VEGETABLES 635

973. 635.659–2.484–1.521.6:575

Pigeon-peas.

Indian Fmg 1940 : **1** : 178–79.

At the Pusa Botanical Sub-station of the Imperial Agricultural Research Institute attempts are being made to combine by hybridization the resistance to wilt (*Fusarium vasinfectum*) of certain strains of pigeon peas (*Cajanus indicus*) with the high yield and quality of the popular but susceptible varieties. Hybrid progenies are grown in artificially infested fields and selections made from the survivors. An attempt is also being made to select a resistant strain from the valuable but susceptible variety Imperial Pusa 69.

Part II. Foreign.

STATISTICS 519

974. Berkson, J. 519.24

A note on the χ^2-test, the Poisson and the binomial.

J. Amer. Statist. Ass. 1940 : **35** : 362-67.

In a previous paper (J. Amer. Statist. Ass. 1938 : **33** : 526–36) the author has described five series of blood-cell counts in the 400 squares of a haemocytometer. In testing whether the observed frequencies followed a Poisson distribution he found that Pearson's χ^2-test gave unsatisfactory results, and he proposed an alternative test. It is known that for large samples from a Poisson distribution the variance s^2 is, on the average, equal to the sample mean m and the author tried therefore to detect discrepancies from the Poisson distribution by testing the ratio ns^2/m by χ^2 (n = degrees of freedom in the sample). The results of this test differed from those obtained by applying Pearson's χ^2-test. In this paper the author describes a sampling experiment designed to explain the discrepancies between the two tests. He finds that for samples drawn from a binomial card population he can detect the discrepancy from a fitted Poisson-series in a larger number of cases if he uses his new test in place of Pearson's test. H. O. H.

975. Camp, B. H. 519.24

Further comments on Berkson's problem.

J. Amer. Statist. Ass. 1940 : **35** : 368–76.

In a previous paper (J. Amer. Statist. Ass. 1938 : **33** : 537–51) the author has given a theoretical explanation for the discrepancy between Pearson's χ^2-test and the test described by J. Berkson (see Abst. 974) when applied to counts of blood cells. In the present paper the author amplifies his explanation by investigating the "power" of the two tests. It appears that the discrepancy is due to the χ^2 test being insensitive in detecting small systematic discrepancies as compared with large random ones. H. O. H.

976. Cochran, W. G. 519.24

Note on an approximate formula for significance levels of z.

Ann. Math. Statist. 1940 : **11** : 93–95. (Abst.).

An interesting note: it is based on the equation of Fisher and Cornish

$$z = \frac{x}{\sqrt{h}} - \frac{x^2+2}{6}\left(\frac{1}{n_1}-\frac{1}{n_2}\right) + \text{a term o}\left(n-\frac{3}{2}\right)$$

in which z is the ordinary variance ratio and x is a normal deviate at the same probability level. It is shown that the third term may be incorporated in the first if this is changed to $\frac{x}{\sqrt{h-\lambda}}$ where λ is a function of the probability level. λ is given for a few significance levels and it is seen that $\lambda = 0{\cdot}95$ for $P = 0{\cdot}05$, thus justifying Fisher's expression in which $\lambda = 1$. H. M. F.

977. Emmert, E. M. 519.24

Partial elimination of experimental error from data by the use of significance tests.

Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 272–78.

In an experiment investigating the relation of yield to nitrogen and phosphorus content in tomatoes, the regression of yield on phosphorus content was calculated and those plots with actual yields differing from estimated yields by more than twice the standard deviation were discarded. By this method the partial correlation between yield and phosphorus content with nitrogen content held constant was improved from the non-significant value of 0·178 to the highly significant value of 0·404.

978. Cox, G. M. 519.24:631.421

Enumeration and construction of balanced incomplete block configurations.

Ann. Math. Statist. 1940 : **11** : 72–85.

"Incomplete Blocks" are a modern variation of the well-known "Randomized Blocks" design of field and other experiments. With the latter design every treatment to be tested in the experiment is alloted (at random) to one experimental unit in the block. In each block,

therefore, the number of these units, called plots, is equal to the number of treatments tested. With certain experimental material the number of "plots" in a "block" is limited. In groups of litters, for instance, the number of animals suitable to be used as experimental "plots" is often small, similarly the leaves on a young plant are limited in number. If it is desired to test a number of treatments which is larger than the number of plots in each block, not all treatments can be represented in each block. In order to avoid a bias of treatment differences by block differences, treatments have to be distributed between "blocks" in what is called a "Balanced Incomplete Blocks" arrangement.

A large number of these arrangements have been tabulated by Fisher and Yates (cf. "Plant Breeding Abstracts", Vol. IX, p. 141).

In this paper the author draws attention to extensive mathematical literature on the theory of geometrical configurations from which new designs can be derived which have hitherto been ignored. H. O. H.

979. FRANKENA, H. J. and BOTH, M. P. 519.24:631.421
Enkele opmerkingen over proefveldtechniek. (Some observations on the technique of field experiments).
Versl. RijkslandbProefst. 's Grav. 1939 : No. 45 (16) A : 427–37.

This is a fairly simple exposition of a method of calculating the experimental errors in working with various crops, in different seasons. The validity of the fundamental calculation (p. 430) is doubtful. J. W.

980. LIVERMORE, J. R. 519.24:631.421
Report of the committee on standardization of field plot technique.
Amer. Potato J. 1940 : **17** : 114–23.

Direct application of the analysis of variance technique is a questionable procedure in experiments where the data conform to Poisson or binomial distribution or where the several variables have different variances. In this report three papers dealing with the problem of calculating errors in such cases are reviewed and commented on.

981. YOUDEN, W. J. 519.24:631.421
Experimental designs to increase accuracy of greenhouse studies.
Contr. Boyce Thompson Inst. 1940 : **11** : 219–28.

In pot experiments on a greenhouse bench there are well marked environmental gradients from the row of pots nearest the glass to the row nearest the centre and from one end of the bench to the other. It has been found that the incomplete block arrangement with complete replications along the bench is a very effective experimental design for such conditions. Four examples of such experiments are given and worked out. A number of new arrangements of Latin Squares with missing rows (Youden Squares) are given in the final section of the paper.

BREEDING 575

982. BABCOCK, E. B. 575:633
Recent progress in plant breeding.
Sci. Mon., N.Y. 1939 : 393–400.

This brief general review covers the utilization of hybrid vigour, breeding for disease resistance, the artificial induction of polyploidy and methods of speeding up plant breeding such as the use of vernalization and growing embryos in nutrient media.

983. CHEW, A. P. 575:633(73)
The United States Department of Agriculture. Its structure and functions.
Misc. Publ. U.S. Dep. Agric. 1940 : No. 88 : Pp. 242.

In the general review of the work of the United States Department of Agriculture, the Bureau of Plant Industry is described in pages 204–11. The work of the bureau is summarized and some of its achievements in crop improvement and introduction and in plant breeding are mentioned.

984. ROBERTSON, D. W. 575:633(78.8)
Plant breeding in agronomy section outlined: several crops discussed.
Colo. Fm Bull. 1940 : **2** : No. 3 : 6–8.

At the Colorado Experiment Station the following crops are being bred: winter wheat, oats,

barley, alfalfa, maize, sugar beets, sudan grass, sorghum, pasture and hay grasses and clover. By combining varieties having one or more good characters attempts are being made to obtain a winter wheat of superior yield, stiff straw, disease resistance, milling quality and the ability to stand in the field until ripe enough for combining. Resistance to disease, mainly smut, is the main object in oats and barley breeding. The bacterial wilt problem in lucerne is serious; all the highest yielding varieties die from wilt after 3 or 4 years harvesting. Several strains of Turkestan show resistance and it is hoped that high yield can be combined with resistance by breeding new strains. Inbred lines of corn resistant to smut have been obtained. It has been found that some lines of Sudan grass have constantly high hydrocyanic acid contents while others are low.

985. 575:633(81)

Informe anual correspondiente al año agricola 1939–40. (**Annual Report for the agricultural year 1939-40**).

Bol. Chacra Exp. "La Previsión" 1940 : **3** : 3–33.

The variety Eureka continues to give the highest yield of all the wheats in cultivation in Brazil but is somewhat low in quality, in which respect it is exceeded by Guatraché M.A. The merits of a number of other varieties are indicated. The variety Kanhard selección La Previsión has retained its resistance to bunt (*Tilletia* sp.). Other varieties are mentioned as being highly or partially resistant.

Yield data are given for forage barleys and oats and for malting barleys; of the malting barleys La Previsión 19 has proved the best in yield, its hectolitre weight and protein content being in no way different from those of the other varieties tested. Resistance to *Ustilago hordei* has been found in the forage barley R.M. 85 and the malting barley Selección 112/30 Bve.

Linseed variety tests have shown the selection La Previsión 18 to be the best, whilst the selections La Previsión 18-2/35 and 4–3/35 are highest in oil content.

986. 575:633(92)
633.00.15(92)

Coolhaas, C.

Een overzicht van de werkzaamheden van het Proefstation Midden- en Oost-Java in 1939. (**A survey of the activities of the Central and East Java Experiment Station in 1939**).

Bergcultures 1940 : **14** : 454–61.

The staff of the Station has been increased to allow for the adoption of the most systematic and accurate methods in field testing of various crops, which is one of the most important activities of the Station.

Preliminary tests of hybrid clones of coffee at Soember Asin have been continued where already numerous new second and third generation clones have been obtained. Similar work under more varied climatic conditions would be desirable.

Special attention was given to crosses of parents that appear suitable for use as grafts with lateral shoots and many new clones are being tested for their merits in this respect.

The species and varieties of coffee brought from Central and East Africa (cf. "Plant Breeding Abstracts", Vol. X, Abst. 836) are to be used on a large scale for breeding, interspecific crosses being regarded as specially important as a method of raising yield, quality and resistance to diseases and pests. Recent cytological findings at the Station will be utilized to the full (cf. Abst. 1080).

The possibility of using cuttings in breeding operations is also to be examined and cuttings from specially good trees are to be collected in seedling plantations on eel worm infested soil and if root formation can be induced the cuttings will be tested in ground artificially heavily infested with *Tylenchi coffea.*

Artificial crossing of rubber trees in which the clone Gondang Tapen I is one parent is in progress and it appears that only crosses with GT I as the female parent are possible since the staminate flowers give no fertile pollen.

Self-fertility studies of cacao clones have shown that the Djati-roenggo clone I is self-sterile and the remaining Nos. 2, 7, 10, 11, 12, 17, 18, 21, 24 and 31 to 42 appear to be self-fertile.

In a preliminary investigation with a number of Assinan mother trees there appeared to be many more self-sterile forms.

A number of cross-pollinations have been made with Dj.1 x Dj.2.

Large numbers of comparative trials have been carried out with different coffee clones in various districts and yield records have been collected for first generation clones. BP 42, SA 13,

BP 39, SA 34, SA 56 and Moemboel III–04 did well in Malang/Kediri and Central Java.
Systematic tests of the various clones as grafts with lateral shoots are being planned.
Tests of hybrid seedlings suggest that the families in which one parent is SA 34 or BP 42 are the best.
Three new test plantations of rubber have been laid down and three more are contemplated.
Tests of rapidity of growth are also being carried out.
The value of treating young buddings with growth substances before planting is suggested by results obtained with planting material after long distance transport.
Yield records were collected for a number of cacao seedlings in test plantations of the families DR 31 to 42. A new large test plantation for seedlings from illegitimate families and also clones has been laid out.

987. COOLHAAS, C. 575:633(92)
Veredeling van Nederlandsch Indische cultuurgewassen. (**Improvement of Netherlands Indies cultivated crops**).
Bergcultures 1940 : **14** : 514–24.

A survey of Mendelism and other genetical principles and their application to the breeding of perennial and annual crops in the Netherlands East Indies. The practical principles of the art of selecting, breeding and producing new plant forms are formulated under seven heads and aptly illustrated by reference to specific work already accomplished by various Dutch and other breeders.
In the discussion that followed the author announced that steps were being taken to establish an experiment plot on high ground where breeding for resistance to unfavourable weather conditions could be undertaken.

988. VAVILOV, N. I. and 575:633.8(47)
NIKITIN, I. L. (Editors). 575:634(47)
[**Molotov's Nikita Botanic Garden during 125 years' activity (1812-1937)**].
Vsesojuznaja Akademija Sel'skokhozjaistvennykh Nauk im. V.I. Lenina (Lenin Academy of Agricultural Sciences) Moscow 1939 : Pp. 192.

The pamphlet contains the following articles of interest to plant breeders:—

Verbenko, G. V. (*Summary of the scientific research work of Molotov's Nikita Botanical Garden during* 125 *years*). (*pp. 3–16*).

The work of the Garden on collection, introduction and improvement of fruit trees, industrial crops such as cotton and tobacco, and essential oil plants is outlined, with plans for future developments.

Rjabov, I. N. (*Results of* 125 *years' work on fruit production at Molotov's Nikita Botanical Garden*). (*pp. 79–135*).

A brief account is given of the development of the work of fruit breeding at the Garden since its inception. This includes extensive collecting expeditions in Soviet territory, which contains the centres of varietal diversity of many of the main fruit trees. The forms collected include yellow fleshed peaches quite free from anthocyanin, a character of value for preserving; early ripening peaches, and others with sweet kernels; myrobalan forms with large fruits and early ripening and forms with free stones; sweet almonds with unusually late flowering; excellent varieties of figs both for drying and canning, and olives with high oil content. Special attention has been given to testing new varieties for suitability for canning. By suitable choice of varieties it has been made possible to supply the main stone fruits for an uninterrupted season extending from late May to mid-October. Hybridization work has been carried out with peaches, apricots, almonds and figs and many interspecific crosses have been made, with the object of producing more hardy, high quality dessert and preserving varieties. Out of 700 intervarietal peach hybrids 16 promising forms from the point of view of quality and time of ripening have been selected. The peach variety Rot Front and the apricot Krasnoščekii Dušistyi (Aromatic Red Cheek), both seedlings from open-pollination, have met with pronounced success. Five new almonds distinguished by their yield and quality have been produced by hybridization and from crosses of the common almond with *Prunus Davidiana*, a self-fertile almond of good commercial quality has been derived. Five new figs of improved yielding capacity and quality have been bred, and also many improved apples, one of which has been named Slava Nikity (Glory of Nikita).
A list is given of the varieties of stone fruits found most suitable for cultivation in the Crimea.

Nesterenko, P. A. (*Industrial crops in Molotov's Nikita Botanical Garden and their role in the people's agriculture. I. Short history of the introduction of industrial crops*). (*pp. 136–70*).

Reference is made to the early work of plant introduction, specially devoted to aromatic, medicinal, textile and oil plants and to the later work of variety testing in respect of yield, quality and content of oil, fibre, etc.

Forms of lavender have been found with 3–3·5% of essential oils in the fresh inflorescences, the oil containing 75–80% of aromatic compounds. Types varying in time of maturity have been found, thus making it possible to extend the time of picking over 1½–2 months. Others are distinguished by upright, dense inflorescences with a large number of flowers in each and variation has been observed in frost and drought resistance. Karyological investigations on the sections *Spica*, *Stoechas* and *Pterostoechas* as well as on *Lavandula vera* have shown the chromosome number throughout to be $2n = 50$. By crossing *L. vera* x *L. spica* 34 hybrids have been obtained, characterized by high yield of flowers and an oil content of up to 13% in the dry inflorescences; the oil of some hybrids contains large quantities (35%) of complex ethers. One triploid ($2n = 75$) has been found.

Forms of *Rosa gallica* superior to *R. damascena* in yield, quality of oil, resistance to rust and frost and capable of growing on their own roots have been found. They have been crossed with the common damask rose, which has degenerated as a result of many generations of vegetative reproduction and is mixed with briar.

Strains of rosemary with 3–3·5% of oil in the dry leaves, high vegetative yield and rapid regeneration have been developed. Cytological investigation has shown that sterility is largely influenced by weather conditions and self-fertile lines with seeds germinating normally have been isolated.

Crossing between *Ocimum canum* and *O. gratissimum* has led to the production of forms with high vegetative yield and oil content, from which 12 kg. of eugenol and 12 kg. of camphor per ha. can be obtained. The eugenol is of first quality and the plants have the advantage of being easily rooted and tolerant of unfavourable conditions. By mass selection in *O. canum* it has been possible to produce uniform populations with an average oil content of 0·6% in the whole plant, the oil containing up to 70% of camphor. By similar means populations of *O. gratissimum* with 30% of eugenol in the oil have been selected and one form of *O. basilicum* contains oil with 70% of eugenol.

Improvements have been made also in the teasel and in *Salvia*. Selection for number of glands per unit area has been found effective in all plants where the oil glands are superficial. The eugenol content can be determined by coloration of the glands.

Various interspecific crosses between species of *Ocimum* containing different constituents showed eugenol and methylchavichol to be dominant to camphor, methylchavichol dominant to eugenol, and all three dominant to linalool and to citral. The content of certain constituents such as methylchavichol and eugenol in some of the hybrids was greater than in the parents and in some crosses new compounds not present in the parental species appeared, e.g. citral in *O. canum* x *O. gratissimum*, borneol in *O. canum* x *Ocimum* sp. No. 49. Other compounds present in the parents are absent in the hybrids. In the F_2 and F_3 there is a tendency to revert partially or completely to the parental types. Amphidiploid progeny have been obtained which preserve the characteristic features of the F_1; in the cross *O. canum* x *O. gratissimum* as many as 2–2·5% of amphidiploids occur. They are somewhat stunted in growth however, with unduly low proportion of leaf to stem and of little potential value in breeding.

Nilov, V. I. (*Chemical changes in crossing plants*). (*pp. 171–92*).

The substance of this paper is more fully dealt with in the first article in the monograph reviewed in Abst. 1093.

989. 575:633:007
635.31–2.452–1.521.6:575
633.13–2.111–1.521.6:575

GILBERT, W. W.
Jesse Baker Norton, 1877-1938.
J. Hered. 1940 : **31** : 273–76.

While working with the United States Department of Agriculture, J. B. Norton was successful in developing a method of breeding for rust resistance in asparagus and by this means originated

the Washington strains of asparagus. Later, when employed as a plant breeder with The Pedigree Seed Company of Hartsville, S.C., he was concerned with the breeding of the Norton cold resistant oats, the Norton melon, and other plants.

GENETICS 575.1

990. HEILBRONN, A. and KOSSWIG, C. 575.1

Principia genetica. Grundbegriffe und Grundtatsachen der Vererbungswissenschaft. (**Genetic principles. Fundamental concepts and basic facts of genetics**).

J. Unified Sci. (Erkenntnis) 1939 : **8** : 229–55.

An attempt to formulate and enumerate (as far as possible in logical sequence) the basic conclusions that have been inductively derived from empirical research on genetics with due regard also to essential axioms and definitions evolved during the growth of genetical science. An index is provided for the 231 concepts defined, with explanatory notes, where considered necessary.

Criticisms are invited from geneticists who could co-operate in solving debatable points and in evaluating the merits of any doubtful scientific results that may have been included in the tabular survey.

991. 575.1:001.4
576.356.2:001.4

The symbolizing of genes and of chromosome aberrations.

Amer. Nat. 1940 : **74** : p. 287.

This is a list of rules for symbolizing genes and chromosome aberrations drawn up by a representative of the international committee in 1939 (Cf. "Plant Breeding Abstracts", Vol. X, Absts. 327 and 679).

992. 575.1:577.8

ALLEN, C. E. 576.312.332:575.18

The genotypic basis of sex-expression in angiosperms.

Bot. Rev. 1940 : **6** : 227–300.

This is a comprehensive review of the subject and includes sections on experimental studies of dioecious species, on sex chromosomes, on gynodioecious species, on male and female sterility in hermaphrodite species, and finally a discussion on the mechanism of sex determination. There is a large bibliography.

993. 575.24:581.03:633.11

SHKVARNIKOV, P. K. 575.24:581.01

(**Mutation in seeds and its significance in seed production and plant breeding**).

Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1939 : 1009–54.

The author reviews the literature on the influence of aging on mutation in seeds. The speltoid and other wheat mutants reported earlier by the author (cf. "Plant Breeding Abstracts", Vol. V, Abst. 915) have remained constant up to F_4 and are here illustrated. The present study concerned the influence of various external factors upon the mutational process. Fresh seeds of Kooperatorka wheat were maintained for varying lengths of time at a number of temperatures, varying from 40 to 60° C., as a result of which the germination percentage was materially reduced. The populations obtained consisted of from 26 to 50% of mutants, according to treatment and some proved more vigorous in growth than the original form. The progeny of the mutant plants too showed in many cases an increased tendency to mutate, squarehead, narrow leaved and speltoid forms being among the variations observed.

Similar experiments on a large scale were carried out with the spring wheat Caesium 0111, the treated seed being sown in the open under ordinary field conditions. Again many mutants were obtained.

Increasing the moisture content of the air at constant temperature also raised the mutation rate in wheat seeds and the rate of chromosome aberration in seeds of *Crepis capillaris*, especially at the rather higher temperatures.

The mutants observed in the second generation of wheat plants included squarehead, compactum and speltoid ears, and variations occurred in respect of size of ear, type of glume,

height of plant, strength of straw and quality of grain. Some are regarded as superior to the original Kooperatorka in agronomic type and worthy of further trial.
The method would appear to have possibilities in plant breeding: the results are certainly of importance to seed producers, since loss of purity can be brought about by the use of old seed or by unsuitable conditions of storage. Experiments were therefore made on seed of Caesium 0111 and the winter wheats Ukrainka and Hostianum that had been dried by heat according to the normal practice. Seeds dried with gases at 70° and 80° C. showed no abnormalities but those treated with gases at 90° and 100° C. or dried at over 45° C. were reduced in germinating capacity and the dividing cells of the young shoots showed varying degrees of chromosomal irregularity. This applied particularly to grain that had got wet and been subjected to a second drying and to grain that had become heated in the stack.
Further experiments on aeration showed that by doubling the oxygen content of the air for 4 months the mutation rate at 20° C. was raised in *Crepis tectorum* from 0 to 5%, and by raising the oxygen content 3·5 times the mutation rate was increased to 10%, whilst an exposure for 20 days to pure oxygen resulted in a mutation rate of 26%. A reduction in oxygen content or storage in pure nitrogen also increased the mutation rate. Thus reduction of the oxygen content from 20·9% to 5% during 20 days gave 11·3% of mutations, and pure nitrogen for the same length of time 15·9%. Similar results were obtained with seeds of *C. capillaris* and of wheat. This again points to the care that must be taken in providing suitable conditions of storage for grain used for seed.
Among the mutant forms superior to the parent in certain characters and equally good in all the rest there were types with greater tillering capacity, others with stronger straw, and some without awns; some give every indication of being higher in yield.
Effects similar to those reported in seeds have been observed also in the case of pollen. It is pointed out that combinations of circumstances, sufficient to produce these effects, may not infrequently occur in nature and the significance of this for the theory and production of pure lines is demonstrated. A pure line becomes a merely relative concept and in addition to preventing as far as possible conditions that lead to mutation, seed producers will have to introduce some system of eliminating those mutants that do occur, if a variety is to preserve any relative degree of purity. It is known, moreover, that some crops are more prone to mutate than others.

994. 575.243:537.531
575.243:535.61–31
STADLER, L. J.
The experimental alteration of heredity.
Growth 1939 : **3** : 321–22. (Abst.).
Whenever germ cells are treated with X-rays, four types of genetic change—mutation, deficiency, translocation, and embryo abortion always occur together and it would be reasonable to suggest that they are all the result of a single basic change produced by the treatment. However, with ultra-violet radiation of appropriate wave lengths embryo abortion, endosperm deficiency and mutations occur without translocations. This suggests that mutations are not merely effects of changed positions of the genes. By the use of other wave lengths, deficiency and mutations may be induced without embryo abortion. Induced embryo abortion may therefore be due to a different process from that involved in chromosome breakage and mutation. These results also suggest that the four changes brought about by X-rays are independent in origin and only associated because of the very powerful agent used.

995. 575.42:581.48:633
LUK'JANENKO, Ja.
(The basis of seed selection).
Sotsialističeskoe Sel'skoe Khozjaistvo (Socialistic Agriculture) Moscow 1940 : No. **1** : 71–85.
Figures are given showing that plants from larger seeds give higher yields and are more generally vigorous and resistant. Examples are presented of improvements in the yield and all-round performance of a variety by selection on this basis alone, which is said to be contrary to the theory of pure lines.
In assessing the value of a variety in addition to the size and weight of the seed consideration should be given also to its germination capacity, protein content and varietal purity.

CYTOLOGY 576.3

996. Resende, F. 576.312.313
Nucléolos e SAT-cromosomas. (**Nucleoli and SAT chromosomes**).
Rev. Agron., Lisboa 1938 : **26** : 129–62.
The author reviews the evidence for the universal presence of satellite constrictions except in the cases where in the absence of a definite nucleolus the nucleolar substance is dispersed throughout the nucleus, for the chromatic nature of the satellite filament, for asymmetrical satellites and their modes of origin, on the value of satellites in giving detailed descriptions of chromosome complements and on their occurrence in the lower plants and animals.

997. Atabekowa, A. J. 576.356.5:537.531:635.656
(**On the mechanism of formation of somatic duplications**).
Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1939 : 510–15.
In extensive examinations of root types of *Pisum sativum* no binucleate cells have been observed in normal roots, though they appeared in large numbers after irradiation with X-rays; such cells usually occurred in sectors and one root is described in which sectors of diploid, tetraploid, hexaploid and octoploid tissue were observed. Not by any means all the binucleate cells undergo fusion of the two nuclei leading to polyploidy.

998. Ruttle, M. L. 576.356.5:581.04
Colchicine and the production of the new varieties of plants.
Rev. Agric. P. Rico 1939 : **31** : 623–31.
A brief account of the use of colchicine in producing polyploid plants.

BOTANY 58

999. East, E. M. 581.162.52
The distribution of self-sterility in the flowering plants.
Proc. Amer. Phil. Soc. 1940 : **82** : 449–518.
In this posthumous paper the incidence of self-sterility throughout the families of flowering plants is reviewed in the light of the author's and others' work. It is pointed out that self-sterility is widespread among the different orders but the distribution is not at random. Self-sterility is much more frequent in herbaceous than in woody plants. Of the eighteen orders consisting primarily of woody plants self-sterility has been established in only two, while in the twenty-five orders consisting entirely or chiefly of herbaceous plants self-sterility has been found in fourteen. This correlation may be due in part to the closer study devoted to agricultural plants, which are predominantly herbaceous types.
Since in view of its complexity as a genetic system self-sterility must be a relatively recent innovation it is argued that it would be expected to be more frequent in the herbaceous plants, which are considered to be less primitive.

PLANT DISEASES AND PESTS 632

1000. Takizawa, R. 632.422.3:575.12
Study on hybridization of yeast.
Jap. J. Genet. 1939 : **15** : 351–52.
Following artificially induced sporulation and micromanipulation of the spores of *Saccharomyces validus* and a baking yeast, a small number of hybrids were obtained. They were of two types, one unlike either parent and the other intermediate in character.
From crosses similarly induced between the Japanese Saké yeasts, Nada No. 1 and Kyokai No. 1, a few hybrids were obtained, which in this case were of only one type and intermediate between the parents. Spores of the hybrid in single culture produced two types, one a yeast resembling Nada No. 1 and the other, a yeast somewhat like Kyokai No. 1.

1001. Yamamoto, Y. 632.422.3:575.125
(**Varietal hybrids in Japanese Saké yeast**).
Jap. J. Genet. 1939 : **15** : 353–55.
Crosses numbering 85 were effected between two Saké yeasts, the true breeding Nada No. 1 and the hybrid Takinokawa No. 6, and diploid forms known to be hybrids were obtained. The process of conjugation is described. The F_1 gave definite evidence of hybrid vigour in weight, odour and fermentative power. The sugar consumption of the hybrid was 82·97% as compared with 60·71% and 72·97% for the parent forms.

1002. 632.451.2:576.16:633.13
633.13–2.451–1.521.6

REED, G. M.

Physiologic races of oat smuts.

Amer. J. Bot. 1940 : **27** : 135–43; also Contr. No. 90 Brooklyn Bot. Gdn.

Twenty-nine physiological races of *Ustilago avenae* and fourteen races of *U. levis* have been found and two keys are given for the differentiation of the races of the two smuts by their abilities to infect different species and varieties of oats. The smut collections have been obtained from widely separated regions. A few varieties of oats -Black Mesdag, Markton, Navarro, and Victoria—and all strains of *Avena brevis* are resistant to *U. avenae.* Markton and Victoria, Red Rustproof and related strains have shown complete freedom from infection by *U. levis.*

1003. SCHNEIDER-ORELLI, O. 632.7:576.16

Vergleichende Untersuchungen an nord- und südschweizerische Reblausmaterial. (**Comparative investigations on *Phylloxera* from North and South Switzerland**).

Mitt. schweiz. ent. Ges. 1939 : **27** : 584–610. [From Rev. Appl. Ent. 1940 : **28** : Ser. A : p. 327].

On the existence of biologically different races of *Phylloxera* and their behaviour on various hybrid vines. Investigations on the possibility of distinguishing the two races morphologically showed that biological and morphological characters did not always agree in the same *Phylloxera* material.

1004. 632.951.1:581.6

(**Investigation on *Derris* cultivation from the chemical point of view**).

Monogr. Gov. Agric. Res. Inst. Taiwan, Nippon (Japan) 1939 : No. **73** : Pp. 40.

This monograph contains some information on varieties and strains of Formosan and Malayan *Derris* with comments on their quality and on the need for crossing or vegetative propagation of selected or imported varieties to obtain the best types for Formosa.

Analyses of the locally grown varieties Hai tuba and Naka tuba showed a total rotenone content of 6·25% in February and 15·00% in July for the former variety, and 7·43% in February and 14·74% in July for the latter: the corresponding figures for crystalline rotenone are 4·48% and 12·12%, and 5·67% and 11·20%.

CEREALS 633.1

1005. 633.1–1.531.12(82)
633.1:575(82)

BOEUF.

L'organisation de la production et du commerce des grains en Argentine. (**The organization of grain production and trade in the Argentine**).

C.R. Acad. Agric. Fr. 1940 : **26** : 374–83.

The author describes the functions of various official organizations engaged in promoting the production of new varieties, outlines the procedure followed in this work and in the registration of varieties and the control of pedigree seed.

The question of the extent to which similar methods might be applied in northern Africa and in France was considered in the ensuing discussion.

WHEAT 633.11

1006. ARZUAGA, J. G. 633.11:575(82)

Perspectivas de producción de nuevas variedades de trigo en el Instituto Fitotécnico de Santa Catalina. (**Prospects of producing new varieties of wheat in the Santa Catalina Institute of Applied Botany**).

An. Inst. Fitotéc. Santa Catalina (1939) 1940 : **1** : 9–15.

Hybrids have been obtained from Chinese 166 (resistant to *Puccinia glumarum*) x Lin Calel and two are promising, being immune to the fungus and superior to the standard, La Previsión 25, in yield and to 38 M.A. in baking quality.

From Ardito x Lin Calel one hybrid somewhat resistant to both *P. glumarum* and *P. triticina* has been obtained; it is equal to Previsión 25 in yield and has good grain of high baking quality.

A wheat of equal quality has been produced from the cross Riccio x Lin Calel, and has surpassed Previsión 25 in yield.
Lines resistant to all three rusts and to loose smut have been produced by the cross Heines Kolben x 38 M.A., and have yielded up to 41% more than Previsión 25, to which they are equal in baking quality. This is regarded as one of the most promising combinations.
It is hoped to effect further improvements in these wheats by crossing the hybrids among themselves or with other recognized varieties.

1007. Kakizaki, Y. and Suzuki, S. 633.11:575"793":581.143.26.03
(**Earliness as influenced by seasonal growth habit in wheat hybrids**).
Jap. J. Genet. 1940 : **16** : 59–63.

Winter wheats differ from spring wheats by having a "winter nature", which can be cancelled by low temperature during germination or by growth under short-day conditions. A winter wheat will ear when its winter nature has been more or less cancelled. Wheats also differ in being either "earlier earing" or "later earing". Low winter nature (i.e. ability to ear when sown in the spring) is more or less dominant to high winter nature. The F_1 between early and late earing is intermediate between the two parents in time of earing. Spring sowings of F_1 hybrids of winter, late earing (WL) x spring, early earing (SE) and winter, early earing (WE) x spring, late earing (SL) were made. The F_1 SE x WL is later than the SE parent but earlier than the WL. The F_1 WE x SL, however, is earlier than either of its parents since lack of winter nature is dominant to high winter nature. If germinated seeds were chilled at 1° C. for 80 to 100 days before sowing, their winter nature was cancelled and it was then found that the WE parent was earlier than the F_1 hybrid WE x SL. It was also found that the number of days by which the F_1 WE x SL was earlier than the WE parent increased with lateness of sowing. This is due to the WE parent having more residual winter nature than the hybrid.

1008. Azevedo, J. P. de 633.11:575.127.2:576.356.2
Estudo citológico dum híbrido *Triticum dicoccum* x *Triticum polonicum*.
(**Cytological study of a hybrid *T. dicoccum* x *T. polonicum***).
Rev. Agron., Lisboa 1938 : **26** : 209–29.

Both dwarf and giant plants appeared among the progeny of the cross and were examined cytologically, Lewitsky's 6 : 4 chrom-formol fixative being used. No cells with either reduced (14) or duplicated (56) chromosome number were detected, but the occurrence of fragments was relatively frequent, the position of the fragments in relation to the chromosomes being variable. Cells with $27 + f$, $28 + f$ and $28 + 2f$ were observed, and occasionally cells with 3 fragments.
The behaviour of the hybrid indicates a fairly close relationship between the two species and the possibility of obtaining amphidiploids is thought to be rather remote.
It is possible that the occurrence of fragments of different types may account for the great variation in ear form observed. The origin of so many fragments is explained on the assumption that in the course of evolution *T. dicoccum* has acquired a number of inversions, which are different from those of *T. polonicum*, leading to the formation of loops in the hybrid and the consequent fragmentation at chromosome separation. Some of the chromosome types appear to be quite stable and it is possible that new forms of agricultural value may arise in this way.
This production of fragments is also suggested as an explanation of the phenomenon of "shift".

1009. Kihara, H. 633.11:575.127.2:576.356.5
(**How to make difficult crosses successful. A suggestion.**)
Bot. & Zool. 1935 : **3** : p. 1196.

A note on the use of a bridging species in obtaining a hybrid between two otherwise incompatible types. As an example the case of the cross between *Triticum Timopheevi* and *T. vulgare* or *T. Spelta* is cited. No hybrid could be obtained from direct crossing with these two species. When *T. Timopheevi* was used to pollinate the pentaploid hybrid *T. polonicum* x *T. Spelta*, however, the cross showed very high fertility. The chromosome number of 157 plants of the progeny ranged from 28 to 34. It is possible that further examination may reveal a plant with $2n = 35$, which would have arisen from the fusion of a gamete of *T. Timopheevi* with a 21-chromosome gamete from the pentaploid. Such a plant is held to be equivalent to a cross between *T. Timopheevi* and a hexaploid wheat. S. E.

1010. O'Mara, J. G. 633.11:575.127.5:633.14:575.11
Cytogenetic studies on *Triticale*. I. A method for determining the effects of individual *Secale* chromosomes on *Triticum*.
Genetics 1940 : **25** : 401–08.

An amphidiploid sector of a wheat-rye hybrid (*Secale cereale* x *Triticum vulgare*) was back-crossed to wheat (*T. vulgare*). The triploid hybrid thus obtained formed 21 bivalents and 7 univalents and produced 70 seeds when allowed to self. Twenty-nine of the 70 progeny were quite fertile, possessed certain rye characters and showed 21 bivalents + 1 to 2 univalents at meiosis. From the 29 progenies obtained by selfing these plants, a single plant from each of 18 progenies was selfed. Of these 18 plants, 9 had hairy-neck, 2 had tapered heads and 7 had awns. These rye characters are in different chromosomes. In the progenies of 8 of the hairy-neck plants, one-third of the plants had hairy-necks and two-thirds were normal; these 8 plants had 21 wheat bivalents plus a single rye univalent. One hairy-neck plant bred true and its progeny of 19 plants all had at least 21 wheat bivalents plus 1 rye bivalent. The 7 progenies from the awned plants behaved similarly to the hairy-neck ones. Plants containing 21 bivalents and 1 univalent produce about one-third plants with awns and two-thirds awnless like the wheat parent; plants with 22 bivalents breed true for awns. The extra rye chromosomes also have other effects on the plants containing them and it is possible to distinguish between rye and wheat chromosomes occurring as univalents by the larger size of the rye chromosomes.

1011. Matsumura, S. 633.11:575.242:576.312.32
(The missing chromosome in B type speltoid wheats).
Jap. J. Genet. 1939 : **15** : 323–24.

When a 40-chromosome, homozygous, B type speltoid was crossed with *Triticum turgidum* the modal chromosome arrangement in the F_1 was $13_{II} + 8_I$. This indicates that the missing chromosome pair in the speltoid lies either in the A or B genom.

When crossed with another 40-chromosome type, *f*-dwarfish, in which the *f* chromosome pair of the D genom was absent, the B type speltoid gave a modal arrangement of $19_{II} + 2_I$ in the F_1. This indicates that the chromosome pair missing from the speltoid is not the *f* chromosome of the D genom. The F_1 of this cross showed higher fertility than either parent, a fact observed in other crosses between different 40-chromosome wheats and attributable to the restoration of a balanced chromosome complement.

The author considers it likely on other grounds that the missing chromosome of the B type speltoid belongs to the B genom. S. E.

1012. Pirovano, A. 633.11:575.243:581.04
Stimoli mutativi sul grano. **(Stimuli inducing mutation in wheat).**
Ricerca Scientifica 1939 : **10** : 693–703.

The author refers to his earlier experiments on the production of mutants in *Cucurbita Pepo* by treatment in an alternating magnetic field, to work of other investigators on other stimulant agents and in particular to the recent experiments on colchicine, including the polyploid *Linum* produced by the author.

Wheat grains treated for 24 hours in 0·1% colchicine solution were delayed in germination. Still further damage was done by immersing for 7 hours, washing, and immersing for 7 hours again when the grains were beginning to sprout. Both plumules and radicles were strongly hypotrophied and only a few of the plants reached maturity.

Mutants with firmly attached glumes were obtained in the variety Virgilio.

By application of an electric current during immersion similar mutants were also obtained, together with one with large ears but very late maturity. Some of the mutants had ears weighing 20% more than the untreated form.

1013. Bodrov, M. S. and
Bystrov, B. A. 633.11:575.243:581.46:537.531
[Branched einkorn (*T. monococcum*)].
Trans. Kirov Inst. Agric. Omsk U.S.S.R. 1938 : **3**(16) : 215–20.

Reference is made to forms with branched ears, three found in *Triticum monococcum* var. *Hornemannii* after irradiation of young shoots with ultra-violet rays and others obtained by treatment with X-rays. The progeny of these plants were nearly all normal but 30 other plants with branched ears were found among the progeny of normal irradiated plants. They are designated "modifications".

1014. Parodi, L. R. 633.11:582
Una especie de trigo que debe cambiar de nombre : *Triticum paradoxum*, nov. nom. (**A wheat species which ought to change its name: *T. paradoxum*, nov. nom.**).
Rev. Argent. Agron. 1940 : **7** : 49–50.
P. Zhukovsky's original Latin description of *T. persicum* published in 1923 is reproduced. The name however is invalid, since *T. persicum* Aitch. et Hems. had been described in 1886. The name *T. paradoxum* is therefore proposed for Zhukovsky's species.

1015. Vasconcellos, J. de Carvalho e 633.11:582
Nova variedade de *Triticum pyramidale* Perc. (**New variety of *T. pyramidale* Perc.**).
Rev. Agron., Lisboa 1938 : **26** : p. 208.
A variety of *T. pyramidale* distinct from any of the botanical varieties already described has been found in cultivation. It resembles the variety *recognitum* but has black awns and has been designated *pseudo-recognitum.*

1016. Bayles, B. B. and
Suneson, C. A. 633.11–1.557:581.46:575.11
Effect of awns on kernel weight, test weight, and yield of wheat.
J. Amer. Soc. Agron. 1940 : **32** : 382–88.
Kernel weights, test weights (pounds per bushel) and yields have been determined for homozygous awnless and awned segregates from two wheat crosses, Triplet x Oro (winter wheats) and Baart x Onas (spring wheats). The grain from awned plants was superior to that from awnless plants of both crosses in kernel weight and test weight. Yield differences were not significant, except for two out of four years with the spring wheat cross where the awned yielded higher than the awnless.

1017. Briggs, F. N. 633.11–2.451.3–1.521.6:575.116
Linkage between the Martin and Turkey factors for resistance to bunt, *Tilletia tritici*, in wheat.
J. Amer. Soc. Agron. 1940 : **32** : 539–41.
Three major genetic factors in wheat are known for resistance to bunt, *T. tritici*. Re-examination of F_3 data suggests that the Martin and Turkey factors for resistance are linked, the cross-over value being 34%.

1018. Peterson, R. F. 633.11–2.452–1.521.6:575.11
Inheritance of resistance of H–44 and Hope wheats to stem rust.
J. Hered. 1940 : **31** : p. 272.
This is a further contribution to the chronology of Hope and H–44 wheats (cf. "Plant Breeding Abstracts", Vol. X, Abst. 730). It is pointed out that field resistance to stem rust was shown as early as 1927 to be governed by one pair of factors in the cross H–44 x Marquis.

1019. Chesnokov, P. G. 633.11–2.7–1.521.6:578.08
(**Methods of characterization selected plants for resistance to *Oscinella frit* L. and *Phytophaga destructor* Say.**).
Proc. Lenin Acad. Sci. U.S.S.R. 1940 : No. 5 : 23–30.
Directions are given for creating conditions optimum for insect development. By growing wheat varieties under such conditions their reactions have been compared. The degree of infestation does not always correspond with the reduction in yield.

1020. Kihara, H. and
Matsumoto, K. 633.11 *Aegilops*:575.127.2:575.115
(**Morphology of species hybrids in the genus *Aegilops***).
Jap. J. Genet. 1939 : **15** : 334–36.
The dominance relations of a considerable number of *Aegilops* crosses with regard to the type of fracture of the rachis are shown in a table. Three types of fracture are recognized, *umbellulata* type, "barrel-shaped" and "wedge-shaped". In the first type the ear is detached as a whole, the rachis breaking at the base, while in the second and third groups the rachis fractures near each node, separating the individual spikelets; the fracture occurs slightly above the insertion of the spikelet in the "wedge-shaped" and slightly below it in the "barrel-shaped" type. The *umbellulata* type is generally dominant to the other two when the *umbellu-*

lata type parent is in the group *Polyeides*, but recessive when other species are used, particularly members of the group *Comopyrum*. Only three combinations of wedge-shaped x barrel-shaped fracture were studied, and the F_1 was of a different type in each case.
The empty glumes in *Aegilops* may be many-awned, single-awned or awnless. All the species belonging to the group *Polyeides* are many-awned. With few exceptions many-awned is dominant over single-awned, and single-awned over awnless. As in the case of the last character, the type found in the most advanced group, *Polyeides*, is dominant.
The paleae in *Aegilops* may also have multiple or single awns or may be awnless. In many cases the order of dominance is the same as for the awns on the empty glumes in the case of the spikelets at the apex of the ear, but cases may be found in which the order is reversed for the lower spikelets. S. E.

1021. KIHARA, H. 633.11 *Aegilops*:582:576.312.32
(A new classification of the genus *Aegilops* on the basis of genom analysis).
Jap. J. Genet. **1939 : 15 : 336–37.**

The genus is divided into six sections, the method of classification differing from that in *Triticum* in that a single section may include both diploids and polyploids, and the polyploids may contain more than one combination of genoms. Each section contains one or more diploid species each with a particular genom, and any polyploids placed in the same section have the same genom in conjunction with others. The sections recognized are: *Polyeides* (basic genom *Cu*), *Cylindropyrum* (genom *C*), *Comopyrum* (genom *M*), *Amblyopyrum* (*Mt*), *Sitopsis* (*S*) and *Vertebrata* (*V*). The *C* series of genoms, *C*, *Cu* and *Cv* are the only ones in which chromosomes with satellites are found.
The new classification agrees approximately with that of Senjaninova-Korczagina (cf. "Plant Breeding Abstracts", Vol. III, Abst. 393). S. E.

OATS 633.13

1022. EMME, E. K. 633.13:575.127.2:581.48
(Hybrids of naked oats. Hybrids of the 42-chromosome naked oats).
Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1939 : 516–30.

EMME, E. K. and
MORDVINKINA, A. I.
(Hybrids of the 14-chromosome naked oats).
Ibid 1939 : 530–40.

The literature on the subject is reviewed critically. The author in her crosses of *Avena nuda chinensis* Fisch. (*A. nuda inermis* Körn) with hulled forms found that the parent was not a pure naked form but a "mosaic hybrid" with a small number of hulled or partially hulled florets and segregation occurred for this mosaic character; some of the segregates in the F_2-F_4 generations were pure naked forms, others pure for leathery husk. Variation occurred also for awns, colour of the inner pale, size of glume and of palea. A definite "shift" was observed in the direction of hulledness; however, by sowing only the least hulled grains of the F_3 14 pure naked forms were obtained in the F_4 of the cross *nuda inermis* x Baie, all of which are expected to be free from shedding. One pure naked type was obtained in the F_2 of the cross prol. *nuda chinensis* x ssp. *Ludoviciana*; it was completely awnless and bred true for this character.
Hybrids between *A. strigosa* Schreb. prol. *nuda* (L.) Hausskn. with *A. strigosa* Schreb. prol. *brevis* (Roth) were in the F_1 all similar to ssp. *strigosa*, with bifloral spikelets, rough awns, long paleae, long hulled grain, awns on the lemma up to 4 mm. in length, pubescence at the base of the awn and second grain; the characters *brevis* were therefore dominant. The F_2, consisting of 114 plants, contained six types, *strigosa*, *substrigosa*, near-*brevis*, *brevis*, *nuda-strigosa* and *nuda*; the first type was identical with the F_1, and the fourth and sixth with the respective parents. There were 90 hulled, 14 mosaic and 10 naked grained plants. Of the 63 *strigosa* type F_2 plants three gave true breeding progeny, the rest segregated, as did most other F_2 types, in such a way that the F_3 contained a marked preponderance of *strigosa* types; the 9 *nuda* types were almost constant in their progeny, except in awning, segregation into awned and awnless *nuda* being observed. Thirty-five constant *strigosa* families were obtained in F_4, many of them resembling forms existing in nature.

Length of palea was inherited independently of hulled v. naked grain; segregation of all the features distinguishing *brevis* from *nuda* was highly complex and could not be explained by less than 3 genes; X^{st} and Y^{st} cause coarse paleae (hulls), inhibit the third, fourth and further florets, reduce the length of the rachilla of the second floret (but not of the pubescence of the paleae); when alone, and heterozygous, they produce the mosaic effect in the palea. Z^{st} augments the effect of these two genes but alone cannot produce hulled grains; in the absence of X^{st} and Y^{st} it produces smooth awns. $X^{st}Z^{st}$ or $Y^{st}Z^{st}$ in the heterozygous condition produce mosaic florets, spikelets or panicles. With X and Y in the recessive state the paleae fail to reach the typical *strigosa* length; the ratio of long to short paleae approaches fairly closely to 15 : 1.
The naked oats in both chromosome groups are thought to have arisen by hybridization between forms that have mutated in different members of the gene complex conditioning hulling.

1023. Coffman, F. A. and Stanton, T. R. 633.13:575.242:581.142
Dormancy in fatuoid and normal oat kernels.
J. Amer. Soc. Agron. 1940 : **32** : 459–66.
Data are given showing that the dormancy periods of normal and fatuoid seeds of 12 varieties of *Avena sativa* and 4 varieties of *A. byzantina* are similar. Where germination is prompt, the data support the view that fatuoids arise by mutation and not by natural crossing with the wild oat, *A. fatua*, which is said, although no data are given in this paper, to have a marked dormancy period.

MAIZE 633.15

1024. Gini, E. 633.15:575.11:581.162.51:576.356
Estudios sobre esterilidad en maíces regionales de la Argentina. (**Studies on sterility in the regional maize forms of Argentina**).
An. Inst. Fitotéc. Santa Catalina (1939) 1940 : **1** : 135–58.
An asynaptic plant as_{34a} and male-sterile plants of the types ms_{33a}, ms_{33b}, ms_{34a}, ms_{34b}, ms_{35a}, ms_{35c}, ms_{35f}, ms_{34f} are described in respect of their phenotype, their genetical and their cytological behaviour. The asynaptic plant showed the customary meiotic irregularities, lack of pairing, etc.; the male-sterile plants were mostly normal in meiosis, though some of the types exhibited certain irregularities. A number of different types of cytoplasmically conditioned male sterility have also been found and are designated ms_{33d}, ms_{33f}, ms_{33h}, ms_{34c}, ms_{34d}, ms_{35h}; all have occurred in Amargo Blanco maize in the district of Entre Ríos.
The gene as_{34a} was found to be distinct from any of the asynaptic genes described by Beadle and all the *ms* genes appeared to be different from the male-steriles of the U.S.A.; ms_{35f} was linked with *Y*, with 7·68% crossing-over.

1025. Sanguineti, M. E. 633.15:575.11:581.481
Estudio del carácter "siamensis" en maíz (*Zea mays* L.). [**Study of the character "siamensis" in maize (*Z. mays* L.)**].
An. Inst. Fitotéc. Santa Catalina (1939) 1940 : **1** : 17–134.
Cases of twinning in the literature on other plants are reviewed. In certain groups of Argentine maize duplications occur in the embryo and resulting seedling, which may be in the form of twin plants united only at the seed, or of a plant with only certain organs such as the coleoptile, plumule, roots, hypocotyl or coleorhiza duplicated, the duplicated parts being always identical and evidently derived from the same ovule. When selfed, the duplicated plants segregated, showing the character to be complex. When crossed with normals they gave normal plants, which segregated in the second generation, giving again a relatively low proportion of affected plants.
Linkage data indicated that the *siamensis* gene (*sn*) was linked either with *b* in chromosome 2 or with *pl* in chromosome 6. The behaviour of the gene was similar to that of the gene sn_{34b} previously reported and it seems probable that the two are identical.
The twin plants examined had always the same number of chromosomes, being in every case diploid.

1026. Singleton, W. R. and Mangelsdorf, P. C. 633.15:575.113.7 633.15:575.116.4
Gametic lethals on the fourth chromosome of maize.
Genetics 1940 : **25** : 366–90.

Two lethal genes, small pollen-1 (*sp*) and lethal ovule-1 (*lo*), which are closely linked with the sugary seeds gene (*su*), have been found in maize and their effects very thoroughly investigated. Pollen grains carrying the gene *sp* are reduced in size and usually do not function in competition with normal grains. When competition between + and *sp* grains is reduced or eliminated, *sp* pollen grains can accomplish fertilization. The *sp* gene is transmitted through part of the female gametes (the survival of *sp* megaspores varies from 0 to 100%). Seeds and plants heterozygous for *sp* are slightly smaller and weaker than homozygous normals. In the homozygous condition the gene *sp* is a seed or seedling lethal so that no mature homozygous plants have ever been obtained. Cytological studies have failed to show that *sp* is a small deficiency. The gene *lo* eliminates practically all megaspores which receive it but has no effect (or a slightly stimulating one) upon pollen grains and no effect on the sporophyte. No substitution of megaspores occurs in plants heterozygous for *lo*. The probable order of *su*, *sp*, *lo* and other genes in the fourth chromosome has been determined by linkage tests.

1027. Graner, E. A. 633.15:575.116.1:581.02
Variações do valor de "linkage." (**Variations in the linkage value**).
Rev. Agric. S. Paulo 1940 : **15** : 168–75.

The dominant inhibitor of black seed coloration *Ci* and the gene for smooth seeds *Sh* in maize are both in chromosome IX, with a cross-over value reported in Europe to be 5·01%. The F_2 of a cross in the coupling phase was studied in Brazil and a cross-over value 4·77% was obtained; this proved to be insignificantly different from the previous figure, showing that the change of environment had not affected the linkage value.

1028. Eckhardt, R. C. and Bryan, A. A. 633.15:575.125
Effect of the method of combining the four inbred lines of a double cross of maize upon the yield and variability of the resulting hybrid.
J. Amer. Soc. Agron. 1940 : **32** : 34–53.

In double crosses involving two inbreds from each of two varieties it is found that the highest yielding combination is that in which the two single crosses are between the two inbreds of the same variety. The highest yielding double crosses were those that combined single crosses of widely different parentage.

1029. Johnson, I. J. and Hayes, H. K. 633.15:575.125:575.148 633.15:575.14
The value in hybrid combinations of inbred lines of corn selected from single crosses by the pedigree method of breeding.
J. Amer. Soc. Agron. 1940 : **32** : 479–85.

The breeding of improved lines by what was designated as the pedigree method of breeding has been previously described in two papers (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1055 and Vol. X, Abst. 135). The present paper is concerned with the relation between the performances of inbreds bred by this pedigree method in inbred-variety crosses and in single crosses. The combining abilities of the inbreds are determined from the inbred-variety crosses which consist of crossing the new inbreds with the variety Minn. No. 13 (cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1244). It is found that single crosses between two low combiners tend to have lower yields than those between two high combiners but that low combiner x high combiner may yield as well as high x high. Additional data show that diversity in genetic origin of inbred lines is important in obtaining maximum hybrid vigour. Many single crosses between inbreds of unrelated origin yielded better than the double crosses used as standards.

1030. 633.15:575.247:581.483
Jones, D. F. 633.15:576.356.2
Growth changes resulting from chromosome rearrangement.
Science 1940 : **91** : p. 423. (Abst.).

The value of the study of paired mosaic areas in the endosperm of maize is discussed; it enables somatic nuclear alterations that are ordinarily never seen by direct cytological examination

to be detected. The results have shown that the relocation of chromosome parts in endosperm may lead to permanent changes in growth activity as well as in colour, size, shape and composition of the cells.

1031. Zapparoli, T. V. 633.15:575.42(45)
Il granoturco Nano precoce del "Teso", o Semetta "Teso". (**The early dwarf maize "Teso" or "Semetta Teso"**).
Ital. Agric. 1940 : **77** : 335–38.

The variety, thought to have arisen by a process of natural selection from the variety Tre Nodi, is dwarf and characterized by extreme earliness and drought resistance and never fails to give a good crop.

1032. Anderson, E. G. and 633.15:576.356.2
Brink, R. A. 633.15:575.116.12
Translocations in maize involving chromosome 3.
Genetics 1940 : **25** : 299–309.

The third chromosome in maize is the third longest and has one arm twice as long as the other. The present study includes twenty-one translocations which have been previously listed and two new translocations obtained by X-ray treatment. The position of ten translocations has been ascertained by cytological examination of mid-prophase of meiosis and backcross linkage tests have been made with the whole twenty-three translocation stocks. It is found that the translocations are distributed over almost the whole chromosome.

1033. Clark, F. J. and
Copeland, F. C. 633.15:581.483:576.312.36
Chromosome aberrations in the endosperm of maize.
Amer. J. Bot. 1940 : **27** : 247–50.

Cytological observations on the dividing nuclei in endosperms of lines of maize having a high frequency of mosaic formation in the endosperm, disclosed a high frequency of abnormal anaphases, such as single bridges and fragments, single bridges alone and double bridges.

1034. Lincoln, R. E. 633.15–2.3:576.16
Bacterial wilt resistance and genetic host-parasite interactions in maize.
J. Agric. Res. 1940 : **60** : 217–39.

Experimental evidence is given showing that the increase in virulence of cultures of *Phytomonas stewartii* (E.F.S.) Bergey *et al.* when passed through resistant hosts and the decrease in virulence after passage through susceptible hosts is due to the differentially selective action of the host on variant lines in the culture. In the case of single-cell cultures these variants probably arise by mutation.

1035. Snelling, R. O.,
Blanchard, R. A. and
Bigger, J. H. 633.15–2.7–1.521.6:575
Resistance of corn strains to the leaf aphid, *Aphis maidis* Fitch.
J. Amer. Soc. Agron. 1940 : **32** : 371–81.

Inbred corn stains differ greatly in the percentage of plants which become infected with the corn-leaf aphid and, although the percentage of plants of the same strain infected in different years varies greatly, there is no doubt that some strains are highly resistant and others highly susceptible.

1036. Marchioni, A. H. 633.15–2.7–1.521.6:575.11
Micropruebas de resistencia a la langosta en el maíz "Amargo". (**Micro-tests of resistance to locust of Amargo maize**).
An. Inst. Fitotéc. Santa Catalina (1939) 1940 : **1** : 159–66.

Seedlings of the lines to be tested were grown together with control seedlings in boxes which were placed in cages containing the locusts. An early form of Amargo known as Amargo Precoz and a hybrid Amargo x Cuarentón proved somewhat less resistant than Amargo, though more resistant than the control variety Piamontés. Certain plants of Amargo Precoz appeared to be more resistant than the rest and seed has been taken from them for further testing.

Further tests were made with mature leaves placed in boxes of moist sand. By this means

it has been possible to select a number of highly resistant Amargo lines. Some F_3 plants of the cross Amargo x Cuarentón proved almost as resistant as the Amargo parent.

BARLEY 633.16

1037. Harlan, H. V., Martini, M. L. and Stevens, H. 633.16:575:578.08
A study of methods in barley breeding.
Tech. Bull. U.S. Dep. Agric. 1940 : No. 720 : Pp. 26.

Using 28 varieties, a total of 379 crosses were made and grown for 7 generations in separate rows. A composite plot was also grown from year to year, starting with a mixture of equal amounts of seed from the F_2 of all the 379 crosses. In 1935 half an acre was space planted with seed from the composite plot and half an acre with seed from the pedigree crosses and 2,921 selections were made from each half-acre. The number of selections made from any given cross depended on the yields given by that cross in previous years. In 1936 the selections were compared for yield.

For the conditions at Aberdeen, Idaho, parent varieties from North Africa and Armenia were better than those from the Balkans, southern Soviet Union, India and China; northern European and Manchurian barley varieties were not promising as parents. Commercial varieties grown in the U.S.A. were not very useful parents in a district different from that in which they are grown.

The performance of a variety itself is not a very good indication of its value as a parent. The collection of barley varieties of the United States Department of Agriculture, Division of Cereal Crops and Diseases probably contains many varieties which would be as useful parents as the well-known varieties.

This extensive experiment showed clearly that six-rowed x two-rowed crosses gave results inferior to six-rowed x six-rowed or two-rowed x two-rowed. Six-rowed selections were better than two-rowed, covered selections better than naked, awned better than hooded and rough-awned slightly higher yielding than smooth-awned. Selections ripening in mid-season were best adapted to Aberdeen conditions and those of average height probably better than very tall ones. Blue aleurone colour appeared to have little or no effect on yield.

It was found that the crosses whose bulked progeny gave high yields were also those which gave high-yielding selections, while hybrid progenies which gave low yields gave low-yielding selections and could therefore have been discarded without loss. From the point of view of the number of superior selections obtained, the composite mixture was as good as the pedigree cultures.

1038. Suneson, C. A. 633.16:581.162.51:575.11
A male sterile character in barley. A new tool for the plant breeder.
J. Hered. 1940 : **31** : 213–14.

Male-sterility discovered in the line C.I. 5368 is governed by a single recessive factor. Bagged spikes of male-sterile plants remain completely sterile, while by open-pollination hybrid seeds can be obtained on a large scale.

1039. Middleton, G. K. and Chapman, W. H. 633.16–1.557:581.46:575.11
Winter survival and yield of rough and smooth awned segregates in fall-sown barley.
Proc. 41st Annu. Conv. Ass. Sth. Agric. Wkrs, Birmingham, Ala., February 7–9, 1940 : p. 86. (Abst.).

Rough awned strains of barley showed a higher average yield than smooth awned strains. In segregates from a cross there was no difference in winter survival between smooth and rough awned but rough awned segregates yielded significantly higher.

MILLETS AND SORGHUM 633.17

1040. Li, H. W., Meng, J. C. and Li, C. H. 633.171:575.11
Genetic studies with foxtail millet, *Setaria italica* (L.) Beauv.
J. Amer. Soc. Agron. 1940 : **32** : 426–38.

There are five distinct colours for the seed coat, which consists of the lemma and palet, and

for these colours the following genetical formulae are suggested:—black, *KRB*; tawny buff, *KRb*; korra buff, *KrB* and *Krb*; sepia, *kRB*; red, *kRb* and tawny red *krB* and *krb*. Classification for seed coat colour is not always easy, particularly when immature seeds are present. Two endosperm characters were investigated and found to be controlled by simple Mendelian factors, non-waxy being dominant to waxy and white being dominant to yellow. It is suggested that palmatic *v* normal earhead is controlled by two factors, P_1P_2 and P_1p_2 being palmatic and p_1P_2 and p_1p_2 being normal. Double earheads are a chance variation and are not inherited.

RICE 633.18

1041. 633.18:575(45)

Una nuova razza di riso: il "Settantuno". (**A new rice variety: Settantuno**).

Ital. Agric. 1940 : **77** : p. 262.

The variety Settantuno (Seventy-one) is a hybrid of Originario Chinese comune, and is characterized by exceedingly high yield, vigorous growth and tillering, abundant foliage and resistance to lodging; it is slightly earlier than the Chinese parent in maturity and has larger panicles.

1042. Opsomer, J.-E. 633.18:575(67.5)

L'amélioration de la culture du riz au Congo Belge. (**Improvement of rice growing in the Belgian Congo**).

Riz. et Rizic. 1939 : **13** : 117–47.

Almost all the rice grown in Belgian Congo is of the upland type and at Yangambi (Stanleyville province) it is sown twice per year in March and September at the beginning of the two wet seasons. In this article the whole of the work of the research station on rice improvement is treated in considerable detail. The influence of size and number of plots on the experimental error of yield comparisons is discussed. Natural crossing has been found to be rare and not to take place between plants separated by a distance of 1·6 m. or more. Introductions of foreign varieties have not been successful and mass selection of Belgian Congo material has only resulted in strains containing no red grains. The methods of obtaining and propagating pure lines are described in detail. By these methods high quality lines with a yield of about 2,500 kg. of pady per hectare giving 60 to 62% of polished rice have been obtained. Artificial hybridization has now been started and details are given of a successful emasculation technique using a small air pump.

1043. Kosaka, H. and Yasukawa, D. 633.18:575.11.061.6:581.035

(**Studies in the response to unfavourable natural conditions of certain varieties of rice plant. 2. Comparison of growth of the plant under the sunlight of various intensities**).

Proc. Crop Sci. Soc. Japan 1939 : **10** : 394–408.

Continuing their observations on pigmentation in rice (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 5), the authors record that varieties with much pigmentation, such as Sekitori, Aikoku and Shito, react favourably to intense sunlight and utilize it to increase the number of tillers, weight of plant and of panicles; whereas varieties such as Kemeno-o, with few genes for pigmentation, react unfavourably to intense sunlight, their growth being inhibited.

1044. Jodon, N. E. 633.18:575.116.1.061.633

Inheritance and linkage relationships of a chlorophyll mutation in rice.

J. Amer. Soc. Agron. 1940 : **32** : 342–46.

In an F_2 of a cross between two strains of rice, 3 : 1 ratios have been obtained for the following character pairs: normal *v.* virescent seedling, clustered *v.* normal floret arrangement, common *v.* glutinous kernels, purple *v.* colourless apiculus and late *v.* early maturity. A linkage map for these characters has also been calculated.

1045. Nakayama, K. 633.18:581.45:575–181.13

(**The relation of chlorophyll content to the anatomical structure of leaves in three dwarf types of rice plant**).

Jap. J. Genet. 1939 : **15** : 272–80.

The dwarf types studied were Ebisu (*AAbb*), Daikoku (*aaBB*), and Kodaikoku (*aabb*), the normal type with which they were compared being Adage (*AABB*). The dwarfs had deeper

green leaf colour and their chlorophyll content per unit leaf area was 130 to 150% higher than the normal. The chlorophyll content per unit of fresh weight, however, was nearer normal. In the region of vascular bundles the dwarfs had thicker assimilatory tissue but midway between the bundles this tissue was thinner than normal owing to the greater development of motor cells.

The cells of the palisade tissue of dwarfs were larger than normal, whereas the cells of the spongy tissue were about the same size as normal. The number of assimilatory cell layers was relatively larger in the dwarfs but no difference in density of these layers was established.

It is concluded that the deep green leaf colour of dwarf types of rice is due to the large size of the palisade cells and the increased number of assimilatory layers.

1046. Mishima, T. 633.18:581.481
(Twin embryos in rice).
Bot. & Zool. 1936 : **4** : 1808–09.

From a microscopic examination of embryos of some twin seedlings of rice the author concludes that they contained twin embryos. Such plants were also noted as being weak in growth.

FORAGE GRASSES 633.2

1047. 633.21:576.356.5:576.16
Litardière, M. R. de 633.21:581.9
Recherches sur les *Poa annua* subsp. *exilis* et subsp. *typica*. Relations taxonomiques, chorologiques et caryologiques. (**Investigations on *P. annua* sub-species *exilis* and sub-species *typica*. Taxonomic, chorological and karyological relationships**).
Rev. Cytol. Cytophysiol. Vég. 1939 : **3** : 134–41.

Cytological examinations of *P. annua* subsp. *typica* and subsp. *exilis* showed the former to be tetraploid ($2n = 28$) and the latter diploid ($2n = 14$). Gigantism was exhibited by the diploid in the size of certain flower parts, the anthers (but not the pollen) and the stomata.

The writer concludes that the most primitive type of *P. annua* is represented by the subsp. *exilis* whose home is the Mediterranean region and which by mutation gave rise to the tetraploid form which is hardier and more adaptable, as is seen by its very wide range of distribution.

1048. Tinney, F. W. 633.21:581.163:576.312
Cytology of parthenogenesis in *Poa pratensis*.
J. Agric. Res. 1940 : **60** : 351–60.

In *P. pratensis* a very conspicuous megaspore mother cell undergoes meiosis but the megaspores disintegrate. A typical embryo-sac develops from a nucellar cell without a reduction division so that the egg cell has the diploid chromosome number. This egg cell grows into the proembryo without fertilization and often before pollination. Pollination does, however, appear to be necessary for endosperm formation and seed development. Occasionally two embryo-sacs, in both of which an embryo is found, may be produced from the division of two separate nucellar cells in the same ovule.

1049. Burton, G. W. 633.266:576.312.35
A cytological study of some species in the genus *Paspalum*.
J. Agric. Res. 1940 : **60** : 193–97.

The following chromosome numbers are reported, $2n = 20$ for *Paspalum ciliatifolium* and *P. paniculatum*, $2n = 40$ for *P. dilatatum, urvillei, malacophyllum, boscianum* and *notatum* and $2n = 160$ for *P. floridanum*. All the most promising pasture species are tetraploid.

1050. 633.282:576.312.35
Church, G. L. 633.283:576.312.35
Cytotaxonomic studies in the Gramineae *Spartina*, *Andropogon* and *Panicum*.
Amer. J. Bot. 1940 : **27** : 263–71.

The chromosome numbers of nine species of *Spartina* are given. Races with different chromosome numbers exist in two of the species. In the genus *Andropogon*, the following chromosome numbers are reported:—$2n = 20$ in *A. virginicus* L. vars *genuinus* Fern. and Grisc., *glaucopsis* (E11) Hitch., *abbreviatus* (Hack.) Fern. and Grisc. and *tenuispatheus* (Nash) Fern. and Grisc., in *A. elliottii* Chapm. and in *A. micranthus* Kunth; $2n = 40$ in *A. scoparius* Michx. vars *divergens* Hackel, *neo-mexicanus* (Nash) Hitch. and *littoralis* (Nash) Hitch.; $2n = 60$ in *A. hallii*

Hack. and in *A. ternarius* Michx.; $2n = 80$ in *A. perforatus* Trin. and $2n = 100$ in *A. saccharoides* Swartz. In addition in *A. provincialis* Lam. two races which are morphologically distinct but which have not been previously classified as separate varieties, were found to have different chromosome numbers, $2n = 40$ and $2n = 60$. Most plants of *Panicum virgatum* L. were found to have $2n = 36$ but three small and very pilose plants had $2n = 72$. *P. virgatum* L. var. *spissum* Linder also has $2n = 36$. The paper includes notes on the chromosome complements, geographical distribution, distinctions between varieties and the relationships of the forms studied.

LEGUMINOUS FORAGE PLANTS 633.3

1051. Tysdal, H. M. and
Garl, J. R. 633.311:581.162.32:578.08
A new method for alfalfa emasculation.
J. Amer. Soc. Agron. 1940 : **32** : 405–07. (Abst.).

Lucerne can be successfully emasculated by first clipping the standards from plants in full bloom, then tripping the flowers to expose the stigmatic column, next immersing the inflorescence in 57% ethyl alcohol for 10 seconds and finally rinsing off the alcohol by transferring to a beaker of water for a few seconds. Before pollination, which can take place successfully immediately after emasculation or as much as an hour later, the adhering water and dead anthers should be blown off the stigmas by a stream of air from an atomizer bulb.

1052. Cooper, D. C. and
Brink, R. A. 633.311:581.162.52
Partial self-incompatibility and the collapse of fertile ovules as factors affecting seed formation in alfalfa.
J. Agric. Res. 1940 : **60** : 453–72.

Data from embryological studies during the first 6 days after self- and cross-pollination of some once inbred plants of lucerne are presented and analysed statistically. The average seed set per flower after selfing was 0·80 and after crossing 4·50. This difference could be accounted for in terms of the lower frequency with which self pollen achieved fertilization (14·6% as against 66·2%) and the higher proportion of fertilized ovules which collapsed after selfing (34·4% as against 7·1%). Self pollen tubes grow more slowly than cross and often pass by the micropyles of unfertilized ovules.

1053. 633.321–2–1.521.6
Sherbakoff, C. D. 633.321:575.11
Breeding disease-resistant red clover.
Proc. 41st Annu. Conv. Ass. Sth. Agric. Wkrs, Birmingham, Ala., February 7–9, 1940 : p. 195. (Abst.).

In this progress report it is stated that lines of clover resistant to anthracnose, powdery mildew and hopperburn have been obtained. The work has also suggested that purple seed colour, leaf mark and red blossom are incompletely dominant to yellow seed colour, absence of leaf mark and white blossom respectively.

1054. Henson, L. 633.321–2.483–1.521.6:575
Breeding for adaptation in red clover.
Proc. 41st Annu. Conv. Ass. Sth Agric. Wkrs, Birmingham, Ala., February 7–9, 1940 : p. 84. (Abst.).

Strains of red clover selected from plants which survived artificial infection with southern anthracnose, *Colletotrichum trifolii* Bain and Essary, showed a higher percentage of survival after artificial infection than the parent strains.

ROOTS AND TUBERS 633.4

1055. Miller, J. C., 633.491:519.241.1:575.1
McGoldrich, F. and
LeClerg, E. L.
Relation of some growth characters to stoloniferous condition in seedling Irish potatoes.
Amer. Potato J. 1940 : **17** : 140–47.

The stoloniferousness of seedling progenies from crosses between domestic varieties of potatoes has been studied and correlated with degree of maturity, height of plant, maximum stolon

length and heat sprouting of tubers. Five types of stoloniferousness are recognized: basal set, tuberous, slightly stoloniferous, stoloniferous and completely stoloniferous. It is suggested that for the selection of superior yielding strains under Louisiana conditions maximum height of plant and earliness of maturity of first year seedlings are useful criteria.

1056. HAUDRICOURT, A. 633.491:575
Les bases de la sélection de la pomme de terre. D'après S. M. Bukasov.
(**The bases of potato breeding. After S. M. Bukasov.**)
Rev. Bot. Appl. 1940 : **20** : 97–116, 179–89.

This article is based on Bukasov's work and in particular on his article in Vol. III of "The Theoretical Bases of Plant Breeding" (cf. "Plant Breeding Abstracts", Vol. VI, p. 327). Notes have been added based on experience in France, in particular on resistance to the Colorado beetle.

The topics covered are the wild and cultivated American species and their role in breeding work, bred varieties, the methods of breeding and the problems to be attacked, namely earliness, quality, resistance to cold, virus disease, late blight, wart disease and Colorado beetle.

1057. MILLER, J. C. 633.491:575:578.08
Technic and methods of breeding Irish potatoes in the south.
Proc. 41st Annu. Conv. Ass. Sth. Agric. Wkrs, Birmingham, Ala., February 7–9, 1940 : 142–43. (Abst.).

Details are given of pollination, harvesting and cleaning of seeds and of growing the seedlings. In selecting for high yield early maturing seedlings should be discarded. The seedlings to select are those of the tuberous and slightly stoloniferous types.

1058. EDMUNDSON, W. C. and SCHAAL, L. A. 633.491–2.484–1.521.6:575
Potato breeding for *Fusarium* resistance.
Amer. Potato J. 1940 : **17** : 92–95.

Both *Fusarium oxysporum* and *F. eumartii* are present in potato fields in Colorado and cause wilt. Hundreds of seedlings have been tested for fusarium resistance and several have shown a high degree of resistance in the field.

1059. KAGAWA, F. 633.492:575.255
(**Chimeras in sweet potato plant**).
Proc. Crop Sci. Soc. Japan 1939 : **10** : 377–83.

From the Kawagoe variety of sweet potato which normally has red tubers, four white tubers were found in 1937 out of six raised from cuttings and a few more whites appeared in the following year. A similar occurrence is recorded for the variety Oiran, but in this case the tubers were not entirely white, but cloudy red in a few places. Moreover, in 1938 each variety produced a tuber which was white and dark red intermingled.

Vegetative cuttings from the white and red tubers remained true to their respective types. The stems and leaves of the new tubers varied in colour and size; the white strain showed much less red in the stem and leaves than did the red strain. The histology of the tubers and stems with special reference to anthocyanin distribution was also studied.

Two possible causes of the aberrant white and spotted tubers are suggested: (1) mutation in one or more genes for anthocyanin production in the cells concerned in the development of adventitious tissue, thus giving rise to spotted tubers; (2) mutation in the genes controlling anthocyanin production during division in the division layer; from such cells cuticle, cortex and inner tissues would be formed, resulting in white tubers if all these cells mutated and in spotted tubers if only some did so.

In either case the colour of the tubers is not determined by that of the stems. Also, the occurrence of white parts in the underground stem of a cutting is attributed to physiological causes distinct from mutation in the genes conditioning anthocyanin production.

FIBRES 633.5

1060. KEARNEY, T. H., PEEBLES, R. H. and SMITH, E. G. 633.51:575:581.6
S x P cotton in comparison with Pima.
Circ. U.S. Dep. Agric. 1940 : No. 550 : Pp. 16.

The S x P variety of American-Egyptian cotton was obtained by repeated selection from the

progeny of Sakel x Pima. The fibre of S x P is appreciably shorter than that of Pima but is long enough to be used as an extra long-staple cotton of the Egyptian type. The variety yields heavier than Pima and also has a consistently higher lint percentage.

1061. Boza B., T. 633.51:575.1(85)
Vistas del nuevo pabellón de genética de algodon inaugurado en Noviembre 1939. *(**Views of the new cotton genetics pavilion opened in November 1939**).
Minist. Fom. Direcc. Agric. Ganad. Estac. Exp. Agric. La Molina, Peru 1939 : Pp. 9.
A brief outline is given of the history and development of the cotton genetics section of the La Molina Agricultural Experiment Station and of the results so far achieved, which have already been reported in full elsewhere.* Descriptions and photographs of the new cotton genetics laboratories are then presented.

1062. Beasley, J. O. 633.51:575.127.2:576.356.5
The origin of American tetraploid *Gossypium* species.
Amer. Nat. 1940 : **74** : 285–86.
An artificial allotetraploid cotton, which is highly female fertile but usually male sterile, has been produced by doubling the chromosome number in hybrids of *G. therberi* Tod., (≡ *G. Thurberi*, an American 13-chromosome species) x *G. arboreum* var. *neglectum* Hutchinson and Ghose (an Asiatic 13-chromosome species). Hybrids are easily obtained by crossing the synthesized tetraploid as female parent with the American 26-chromosome allotetraploid species. The hybrid *therberi* x *arboreum* forms less than 6 bivalents at meiosis and anaphase bridges are common. The synthesized tetraploid usually forms 26 bivalents and the hybrid between the synthesized tetraploid and natural tetraploids forms 24 to 25 bivalents plus 4–2 univalents. The hybrids between the two tetraploids set seeds when self-pollinated and also in reciprocal crosses with the natural tetraploid. These facts suggest that the American 26-chromosome cottons are allotetraploids, one parent being similar to American 13-chromosome species and the other to Asiatic 13-chromosome species.

1063. Beasley, J. O. 633.51:575.127.2:581.162.5:578.08
Hybridization of American 26-chromosome and Asiatic 13-chromosome species of *Gossypium*.
J. Agric. Res. 1940 : **60** : 175–81.
It is very difficult to obtain hybrids between cultivated Asiatic 13-chromosome and American 26-chromosome species of cotton. This is not due to poor pollen tube growth or to fertilization not occurring, but is caused by disintegration of the endosperm after a few days' growth followed by death of the hybrid embryos. By pollinating 26-chromosome cottons as females with a few pollen grains from 26-chromosome species and a large excess of 13-chromosome pollen grains there are obtained large seeds which germinate easily and a number of small seeds. The large seeds produce 26-chromosome cottons. By germinating the small seeds on sterile culture media plants were obtained which proved to be hybrids with 39 chromosomes.

1064. Necati Turgay, S. 633.51–1.557–1.524(56)
La question cotonnière en Turquie. (**The cotton question in Turkey**).
Cot. et Cult. Coton, 1939 : **13** : 51–53.
Among the measures for the improvement of this crop are (1) a regional survey of the cotton zones to determine and prescribe the Upland variety best suited for the various regions; (2) replacement of old degenerated Upland (iâne) varieties by the new ones. In general the new varieties give a definitely better yield than the indigenous varieties.

1065. Oudot, G. 633.513(92+59.7)
Plantes à fibres. (**Fibre plants**).
Bull. Écon. Indochine **1940** : **43** : 77–91.
In this paper, which is an extract from the Report of the mission from Indo-China to the Netherlands East Indies August–October 1937, an account is given of the extent and methods of cultivation of kapok, *Agave* and roselle in the Netherlands East Indies. Various plantations

* The work referred to in this brief survey has been described in detail in the Annual Reports of the station, extended English summaries of which are available on loan from the Bureau.

of different varieties and their value are discussed, including the giant kapok (Reuzen Randae), the varieties Koening, Japara, Lanang, local forms and some imported African types, with some observations on time of fruiting and results obtained by grafting various types.
Some very homogeneous lines are stated to have been obtained from crosses of African and local forms of kapok.
The selection work and hybridization and variety trials in progress with kapok at Buitenzorg are briefly described; and *Bombax* and *Eriodendron* (imported from America, especially Mexico) are also included in the collection of exceptional material. Progenies obtained by artificial pollinations, representing crosses of indigenous varieties *inter se* and with African types, are being grown for study and for selection. One progeny from a cross of a local variety x Congo x Saïgon appears of special interest, as does also a series of progenies obtained by systematic hybridization with African and Saïgon forms. The latter form is probably the Cambodia kapok which is noted for its abundant fruits of large size.
Comparing kapok improvement in Java and at the Giaray Station in French Indo-China the author considers that, though the methods employed at both centres are the same, progress is greatly handicapped in the French territory by the ravages of parasites and adequate funds for transferring the experimental centre to apparently safe districts are not yet available. Improvement work should be pressed forward and steps should be taken to prevent any further supplies of seed of different varieties from being conveyed to the Netherlands East Indies where kapok improvement is proceeding apace and is under control as regards the exportation of seed.
Much of the original material for kapok breeding in the Netherlands East Indies was obtained from French West African colonies.
Though morphologically the African plants undergoing selection in Indo-China are much less homogeneous than those in Java, they contain a relatively slight number of grey fibred types as compared with the latter, which have this feature as well as a high percentage of trees with dehiscent fruits.
The possibility of developing successfully the cultivation of *Agave sisalana* (not *A. cantala*) and of *Hibiscus Sabdariffa* in Indo-China is also suggested.

1066. Pawluchin, A. J. 633.52–2.183–1.521.6:578.08
(Methods of evaluation of resistance against lodging of strains of flax for fibre production during the first stages of selection).
Proc. Lenin Acad. Sci. U.S.S.R. 1940 : No. 3 : 17–20.

The resistance of the stems to lodging and their capacity for recovery were judged by applying artificial rainfall at the time of flowering. Clear differences were observed between varieties and corresponded to the behaviour of the varieties in the field.
The method is thought to be applicable also to cereals.

SUGAR PLANTS 633.6

1067. Rands, R. D.,
Abbott, E. V. and 633.61:575(76.3)
Summers, E. M. 633.61–2–1.521.6
Disease resistance tests and seedling selections in 1938 and 1939.
Sug. Bull., N.O. 1940 : **18** : No. 15 : 5–9.

The position of commercial varieties of sugar cane and varieties in the testing fields, with respect to the diseases prevalent in Louisiana, is reviewed.
In 1938, 85 out of a total of 10,793 seedlings and in 1939 76 out of 7,103 were assigned C.P. numbers at the Houma station. The following crosses have shown themselves productive of seedlings combining high disease resistance with good commercial qualities:—Co. 281 x U.S. 1694, Co. 281 x P.O.J. 2878, Co. 281 x C.P. 1165, Co. 281 x C.P. 29/290, P.O.J. 2725 x C.P. 116, P.O.J. 2725 x C.P. 1161 and P. 33/30 x C.P. 1161. Of 19 seedlings from the last combination, 12 were given C.P. numbers and 3 of them have been distributed to the co-operative test fields.
By pollination of P.O.J. 2725 by the Turkestan forms of *Saccharum spontaneum* Amu Darya 59 and 60 and U.S. 4513, a total of 1,430 hybrids have been obtained and tested for mosaic resistance; 55 to 66% in the different progenies were susceptible.
Selected, apparently immune seedlings have been distributed to other stations for cold resistance tests (cf. also "Plant Breeding Abstracts", Vol. X, Abst. 502).

1068. 633.61:575(91.4)
UICHANCO, L. B. 633.61–2–1.521.6
The College of Agriculture and the Philippine sugar industry.
Sug. News 1939 : **20** : 385–86, 394.
The Philippine College of Agriculture was opened in 1909 and has had a close connexion with the development of the sugar-cane industry. The College of Agriculture has produced strains of cane such as C.A.C. 117 and has also investigated the resistance of cane varieties to disease and insect pests.

1069. WELLER, D. M. 633.61:576.356.5:581.04
Colchicine in relation to sugar cane breeding.
Presented before the Agricultural Section of the Hawaiian Sugar Technologists December 12, 1939 : Pp. 11. (Mimeographed).
After a popular account of the action and use of colchicine it is mentioned that several thousand sugar cane seedlings have been raised from colchicine-treated seeds. Though the characteristic effects of colchicine treatment were noted, such as broadening of the coleoptile, spindle abnormalities, etc., there is no mention of polyploid individuals being obtained.

1070. SARTORIS, G. B. 633.61:581.145.1:581.143.26.035.1
The behavior of sugarcane in relation to length of day.
Sug. News. 1939 : **20** : 421–24; also Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 796–802.
A variety of *Saccharum spontaneum*, 28 N.G. 292, from New Guinea, was induced to flower when exposed to a 13-hour day. It did not flower on a 12- or 14-hour day. None of the 4 other varieties included in the experiments were induced to flower and it is suggested that in sugar cane a certain amount of vegetative growth is necessary before a plant is capable of flowering under the appropriate length of day, which for most canes is probably 12 hours.

1071. BRANDES, E. W. 633.61–2.111–1.521.6
Survival of wild sugarcane buds exposed to below zero (F.) temperatures.
Sug. Bull., N.O. 1940 : **18** : No. 16 : 3–4.
A few buds (about 1%) on vegetative stems of plants of *Saccharum spontaneum* from Turkestan withstood temperatures below zero Fahrenheit in January and sprouted in April. Hybrids between this wild cane and commercial cane were killed by temperatures of 25° to 26° F.

1072. ABBOTT, E. V. 633.61–2.8–1.521.6
A progress report on the study of chlorotic streak of sugarcane in Louisiana.
Sug. Bull., N.O. 1940 : **18** : No. 19 : 3–6.
Chlorotic streak appears to be spreading in the sugar belt of Louisiana. The disease is found on most varieties but is most prevalent on C.P. 29 320. Two varieties, Co. 281 and 290, have so far proved resistant to infection.

1073. 633.61.00.15(92.2)
BOOBERG, G. 633.61:582
Verslag der cultuurafdeeling van het Proefstation voor de Java-Suikerindustrie te Pasoeroean over het jaar 1939. (**Report of the crop section of the Experiment Station for the Java Sugar Industry at Pasoeroean 1939**).
Jversl. Veer. Proefst. Java-Suikerind. 1939 : 9–24.
Among the various activities of the Experiment Station at Pasoeroean during 1939 are mentioned: the inspection of varieties, supplying planting material, identification and description of varieties, the planning of numerous field experiments, field trials and the statistical evaluation of scientific data on different problems.
No particulars are given of the cane breeding and the relevant cytological research that are stated to be in progress.
Two varieties H(andels) V(ereeniging) A(msterdam) 90 and G(erarda) W(ilbrink) 222 were sent in for registration and duly described. The study and description of the plant material in the Original Collection were recommenced. (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 343).

1074. Miščenko, A. S. (Editor) 633.63:575(47)
(Symposium on the research work of the State Research Institute for the Sugar Industry (VNIS) on beet cultivation and beet seed production).
Vsesojuznyi N–I Institut Sakharnoi Promyšlennosti (Sci. Inst. Sug. Ind.)
Kharkov and Kiev 1939 : Pp. 318.

This symposium contains a number of articles, of which the following are of interest to plant breeders.

Miščenko, A. S. (*The main achievements of the Soviet Research Institute for the Sugar Industry in recent years and problems for the third Five Year Plan*). (*pp. 5–22*).

Post-revolutionary Russia is entirely supplied with home bred sugar beet seed. Varieties recently released are distinguished by a much higher sugar production per hectare, cross-breeding having been largely responsible for this improvement. By Lysenko's method of phasic crossing forms with greatly reduced tendency to bolting have been produced. Crossing with wild beets and chard has made available a much wider range of material for selection. New, higher yielding varieties of winter wheat, oats, clover and other crops have also been put on the market.

Plans for the third Five Year Plan include: "The reduction of the time required to produce a new variety, the production of varieties resistant to *Cercospora* and to silage rot, the creation of varieties free from bolting and early in maturity by the method of phasic crossing and of more productive forms by suitable methods of crossing, the alteration of the qualities of the different types by growing them together on the principle of selective fertilization, the elaboration of a method of choosing parental pairs on the basis of phasic development and response to manuring and to particular conditions of growth, the elaboration of a method of breeding varieties by mass and individual plant selection on the basis of the data from diallel crossing and from the growing of the hybrids under different ecological conditions, the improvement of varieties by intravarietal crossing and the acceleration of breeding work by the use of electrified greenhouses".

Orlovskii, N. I. (*The method of determining the progress made in sugar beet production*). (*pp. 280–85*).

The author points out that the behaviour of a variety may be very different in different conditions of environment or soil composition and it is wrong therefore in comparative tests covering a large range of areas to use the same standard variety throughout. In addition to comparison with a given standard therefore a new variety should be compared in each region with several standards of different type and also with the average of all the varieties under test. No variety should be used as standard until it has been under observation for at least three years.

Beregovaja, M. M. (*The method of artificial infection of sugar beet stecklings in connexion with breeding for resistance to Cercospora*). (*pp. 302–08*).

Seedling reaction has been found to correspond closely to the reaction of the full-grown plants. Testing should in any case be carried out before flowering starts so that susceptible plants may be removed before their pollen functions. An efficient method for artificial infection is described.

1075. 633.63:575(47)
*Panasjuk, M. P. (Editor) 633.1:575(47)
[Main conclusions from the scientific research work of the State Research Institute for the Sugar Industry (VNIS) for 1937].
Vsesojuznyi N–I Institut Sakharnoi Promyšlennosti (Sci. Inst. Sug. Ind.)
Moscow–Leningrad 1939 : Pp. 484.

The monograph includes an extensive section on breeding and genetics of sugar beet, containing the following articles: Orlovskii, N. I., "The breeding work with sugar beet at the Stations of the 'Glavsakhar' in 1937 (pp. 263–68)", giving a general review of the work; "Results of the state variety tests with sugar beet in 1937 (pp. 269–73)", indicating the performance of the varieties produced by each of the breeding stations; "Results of the regional

* An extended summary of the monograph is on file at the Bureau.

tests of sugar beet in 1937 (pp. 273–77)" –the varieties produced by a particular station tend to thrive in certain definite regions and not in others; Sempolovskii, L. L., "Brief conclusions from the work of the beet section of the Uladovka-Ljulintsy Breeding Station in 1937 (pp. 277–80)", new strains have exceeded the standard varieties in yield, sugar percentage or both; Grin'ko, T. F., "Results of breeding sugar beet at the Verkhnjačka Station in 1937 (pp. 281–88)", strains superior to the standard in both yield and sugar content have been produced by hybridization; Helmer, O. F., "Main conclusions from the work of the breeding section of the Ivanovka Station in 1937 (pp. 288–92)", high yield x high sugar types were studied and the results are reported in detail, together with the results of testing and crossing inbred lines; Gudvil, S. V., "The chief characteristics of the breeding work of the L'gov Station in 1937 (pp. 293–302)", tests of lines and mixtures of lines of known manurial response have given promising results and improved beets have been produced by phasic crossing; Mazlumov, A. L., "Brief conclusions on the main work of the beet section of the Ramon' Station in 1937 (pp. 302–06)", selection has been carried out for resistance to silo rot (*Botrytis cinerea*) and freedom from bolting; Šelekhov, N. N. and Sevost'janov, S. P., "The main results of sugar beet breeding at the Pervomaisk Station in 1937 (pp. 306–10)", crosses have been made with first class lines and also with *Beta maritima* and the chard, some of the hybrids being resistant to *Cercospora*; Egorov, V. A., "Brief conclusions on sugar beet breeding at the Belaja Tserkov' Station in 1937 (pp. 310–15)", crosses between sugar beet and forage beet or wild beet are promising in yield, sugar content, resistance to *Botrytis* and to *Cercospora*; Dubinin, P. A. and Orlovskii, N. I., "The main results of breeding work with sugar beet at the Biisk Station in 1937 (pp. 315–18)", varieties with improved yield and sugar content have been produced; Lobodin, K. I., "Brief conclusions on the breeding of sugar beet at the Veselyi Podol Station in 1937 (pp. 319–22)", the highest yields and sugar content have been given by the hybrid material, the study of which indicates that an increased range of physiological adaptability is attainable by crossing the high-yield with the high-sugar types; Čebolda, V. F. "Brief conclusions on the breeding of sugar beet at the Frunze Sub-Station in 1937 (pp. 322–26)", selection has been made for reduced bolting, sugar yield and manurial response; Fedorovič, L. I., "Brief conclusions from the work on variety tests in sugar beet at the Jaltuškovo enlarged Sub-Station in 1937 (pp. 326–29)", a number of lines have been crossed with three different genetic types and the results are tabulated; the different combinations varied greatly and some have given record results; the progeny of plants with one-seeded seed-balls has been studied; "Selection of sugar beet for resistance to bolting (pp. 329–32)", winter sowing followed by selection of non-bolters led to a reduction in bolting of 50% in the first generation; Murav'ev, V. P., "Comparative tests of varieties of sugar beet resistant to *Cercospora* (pp. 333–34)", F_3 hybrids between sugar beet and wild *B. maritima* have proved highly resistant, some hybrids of the Oberndorf mangel being also resistant; Brojakovskii, N. V., "Breeding sugar beet for resistance to diseases (pp. 334–36)", improvement has been effected in resistance to both *Botrytis* and *Cercospora*; Demčinskaja, E. N., "Study of the phasic development in beet varieties (pp. 336–38)", experiments showed that the F_1 progeny of forms with a short light stage had a higher percentage of bolters; Vasil'ev, L. V., "Study of the phasic development in beet of the species *Beta vulgaris* L. (pp. 338–40)", bolting can be very materially reduced by crossing suitably chosen parents; Nigovskii, N., "Production of seed from clones of sugar beet in first year (pp. 340–42)", by the use of continuous light flower stalk formation was greatly hastened, the progress of flowering being further accelerated by a period of low temperature and suitable moisture; Filatova, T. A., "Diagnosis of vernalization in seeds of sugar beet (pp. 342–43)", the degree of vernalization of seeds can be determined by the intensity of the reaction on Phenol Red and Cresol Red; "Growing beet in the winter in the greenhouse with the object of speeding up breeding work (pp. 343–46)", a period of 45 to 60 days in the cold (8–10° C.) is necessary to ensure flower stalk formation; Buzanov, I. F. and Popova, A. A., "The question of growing beet in the winter in the greenhouse (pp. 346–49)", the most suitable manurial treatment was different in different conditions of temperature, light, etc.; Filatova, T. A., "Anatomical and histological investigation of sugar beet grown in the greenhouse at different temperatures (pp. 349–51)", too high temperatures during the period November to March have the effect of reducing the yield both of roots and of seed; Savitskii, V. F., Gaevskaja, I. G. and Stepčenko, V. D., "Yield of hybrids of beet whose seeds were grown in the winter in the greenhouse (pp. 351–52)", hybrids of sugar beet and mangel were all high in yield, though

in sugar content they are still inferior to sugar beet, with which it is proposed to back-cross them; Savitskii, V. F., "Two types of inheritance of sugar content in *Beta vulgaris* L. (pp. 352–57)", hybrids of sugar beet with other sugar beet, forage or table beets are mainly intermediate in sugar content; on the other hand crosses involving the chard are much higher than the average of the two parents in sugar content, being frequently equal to the sugar beet, the high sugar contents being retained in later generations; the chard crosses are regarded therefore as a promising starting point for breeding, and the chard is thought to have contributed very directly to the origin of the sugar beet; Bordonos, M. G., "Investigation of the inheritance of one-seeded seed-balls in beet (pp. 357–59)", plants with one-seeded seed-balls were mostly late in flowering and in order to make this an economic character it will be necessary to select for earlier flower development; Zosimovič, V. P., "Hybridization of wild and cultivated forms of the species *Beta vulgaris* L. (pp. 359–61)", immunity to *Cercospora* is dominant in crosses between sugar beet and *Beta maritima*, the F_2 and back-crosses with sugar beet indicating the presence of at least two pairs of factors for immunity; Zosimovič, V. P., "Origin of the hexaploid species *Beta trigyna* W. et K. (pp. 361–62)", the species is represented by both tetraploid ($2n = 36$) and hexaploid ($2n - 54$) members, the latter having a more westerly distribution. The latter when crossed with *B. lomatogona* ($n = 9$) gave a fertile tetraploid hybrid which closely resembled the hexaploid *B. trigyna*. An amphidiploid ($2n = 54$) was obtained by crossing tetraploid *B. trigyna* with *B. lomatogona* and was also phenotypically indistinguishable from the hexaploid *B. trigyna*, which is thought therefore to have originated in this way; Okanenko, A. S., "Biochemical study of beet hybrids (pp. 362–65)", the contents of sucrose, monosaccharides, catalase, invertase, nitrogen and salts and their distribution in the different tissues were studied in hybrids between Eckendorf mangel and sugar beet, sugar and semi-sugar beet and chard x Dewing table beet; the chard crosses were much the most valuable. The presence of considerable quantities of reducing sugars in these hybrids and in the back-cross with sugar beet makes it necessary to carry out special selection to reduce this component, since it varies independently from sucrose; Zaikovskaja, N. E., "The reduction division in interspecific hybrids of the genus *Beta* L. (p. 366)", considerable meiotic irregularities were observed in the hybrid *B. vulgaris* (sugar beet variety Uladovka) x *B. lomatogona*. The hybrids *B. macrorhiza* x *B. trigyna* and *B. lomatogona* x *B. trigyna* were somewhat less irregular and *B. macrorhiza* x *B. lomatogona* less still. Pairing of the chromosomes indicated that the *B. lomatogona* chromosomes are more homologous with *B. macrorhiza* than with *B. vulgaris*; Kovalevskaja, M. F., "The question of experimental production of mutations in beet (pp. 367–69)", plants obtained after wounding contained 29·5% of tetraploids and 21·3% of chimaeras, some with 18 + 36 and some with 18 + 36 + 72 chromosome tissue; Kharečko-Savitskaja, E. I., "Controlling the process of self-fertilization in sugar beet (pp. 369–71)", self-fertility in sugar beet was found to be materially increased by reduction of temperature; Filatova, T. A., "Histochemical investigations of the growing point of the axillary buds of sugar beet roots (pp. 371–72)", only those buds that have passed through the vernalization stage and are going to produce flowering shoots contain starch in the cells immediately below the growing point; Buzanov, I. F., "The question of seed irradiation of sugar beet with ultra-short waves (pp. 372–75)," the treatment had a negative effect; Marinčik, G. F., "The influence of hormones on the yield of sugar beet (pp. 375–77)", insulin and ovarin accelerated germination and increased the sugar content.

A further section is devoted to cereal breeding, containing articles as follows: "Main results of breeding cereals and leguminous plants in 1937 (pp. 378–82)", a review is given of the breeding work on cereals and leguminous plants at the various stations of the sugar trust; Petojan, S. A., "The results of breeding work with winter wheat at the Ivanovka Station in 1937 (pp. 382–84)", some of the new varieties combine resistance to rust and smut with improved yield and grain quality and winter-hardiness; Pokhil', I. F., "Intravarietal crossing in winter wheat at the Verkhnjačka Station (pp. 384–86)", there was no increase in yield in Ukrainka but Lutescens 09 showed a slight improvement in both yield and type of plant; Vakhrušev, E. T., "Brief summary of breeding work with winter wheat at the L'gov Station in 1937 (pp. 386–88)", parental combinations have been chosen according to Lysenko's principle of phasic crossing and some combinations have given highly promising progeny; Pokhil', I. F., "Results of work on breeding winter wheat at the Verkhnjačka Station in 1937 (pp. 388–89)", hybrids produced by the station include Lutescens 09 and Lutescens 17; Gorlač, A. A., "Results of breeding work with winter wheat at the Belaja Tserkov' Station

in 1937 (pp. 389–91)", the new variety 200 Belaja Tserkov' is resistant both to rust and bunt and is at the same time possessed of excellent standing capacity, grain quality and yielding ability, in all of which respects it has surpassed Ukrainka; Kovtun, T. D., "Brief conclusions from the winter wheat breeding at the Veselyi Podol Station in 1937 (pp. 391–92)", new varieties superior to Ukrainka are described; Zadler, V. V., "Varietal analysis of winter wheat in the laboratory (pp. 392–93)", resorcin and α-naphthol were found to give a wider range of colorations than phenol; Gromik, I. U., "Brief conclusions on breeding leguminous crops at the Uladovka-Ljulintsy Station in 1937 (pp. 393–96)", improved strains of peas include forms ripening 5 days before the standard, others of higher yield and quality, others resistant to *Ascochyta*; Kurbatova, A. T., "Results of the inter-station varietal testing of peas (pp. 397–98)", the highest yields have been given by variety U.L.S.S. 303, which was 11·9% above the standard, Mandorf's Victoria; Zagorodnjuk, Ja. F., "Results of work on breeding oats at the Verkhnjačka Station in 1937 (pp. 398–99)", Verkhnjačka 0339 is highly resistant to rust, has given yield increases of 10 to 15%, has white grains and a number of other favourable characters; Zelenskii, S. S., "Breeding oats at the L'gov Station in 1937 (p. 399)", varieties superior to Victory in yield and resistance to fungous diseases including crown rust have been produced; Kurbatova, A. T., "Breeding work with forage plants (pp. 400–04)", ecotype selection has been carried out on collections of the local types of leguminous forage plants and has demonstrated their great value as breeding material; Boris, P. M., "Results of work on breeding forage plants at the Belaja Tserkov' Station in 1937 (pp. 404–08)", winter-hardy red clover, disease resistant lucerne and drought resistant spring vetches have been produced; Martynenko, F. D., "Brief conclusions from the work on breeding red clover at the Uladovka-Ljulintsy Breeding Station in 1937 (pp. 408–10)," certain mixtures have proved more successful either than the original population or the products of individual plant selection.

1076. Graner, E. A. 633.682:576.356.5:581.04:581.49
Tratamento de mandioca pela colchicina. I. Nota preliminar sôbre poliploidia indicada pela diferença de tamanho dos estômatos. (**Treatment of cassava with colchicine. I. Preliminary note on polyploidy indicated by the difference in size of stomata**).
J. Agron., S. Paulo 1940 : **3** : 83–98.

Forty plants of the cassava variety Vassourinha Paulista were treated with colchicine and measurements were made of the leaf stomata in 22 of them, together with 9 control plants. Preliminary statistical study of the measurements showed that great variation exists from leaf to leaf and that only stomata on well developed leaves from approximately the same position on the plant should be taken for comparison. The treated plants were of two types; in one type the figures for stomatal size were almost identical with those for the control plants (29·2μ and 30·6μ respectively), while in the other the stomata were significantly larger (40·7μ), the lowest value for this group being higher than the highest for the other group. The stomata in the group with the larger values were also more variable in size. These plants are thought to be probably tetraploids and their chromosome number is to be determined later.

STIMULANTS 633.7

1077. Clayton, E. E. 633.71–2.6–1.521.6:575
Resistance to root knot nematode in *Nicotiana*.
Proc. 41st Annu. Conv. Ass. Sth Agric. Wkrs, Birmingham, Ala., February 7–9, 1940 : p. 200. (Abst.).

By repeated selfings it has been possible to obtain apparently homozygous lines of *Nicotiana Tabacum* with a rather high degree of nematode resistance, though other species of *Nicotiana* show a much higher degree of resistance.

1078. Lima, A. R. and
Costa, A. S. 633.71–2.8–1.521.6:575.127.2
Variedades de fumo resistentes a "Vira-cabeça". (**Varieties of tobacco resistant to wilt**).
Rev. Agric. S. Paulo 1940 : **15** : 133–40.

Resistance to the disease, which is thought to be due to a virus similar to the spotted wilt virus of tomatoes, is found only in *Nicotiana glauca*. The allotetraploid *N. Tabacum* x *N.*

glauca displays a certain amount of resistance, distinctly greater than that of the control variety Turkish.
Among the many strains of *N. Tabacum* tested with the virus only one has shown any sort of resistance; this was the variety Sumatra 38, which is being crossed with other varieties.

1079. François, E. 633.73:575(69)
L'avenir de la culture des caféiers à Madagascar. Etat actuel de la question. (**The future of the cultivation of coffee in Madagascar—Present position**).
Rev. Bot. Appl. 1940 : **20** : 153–64.
This article deals at considerable length with economic and cultural methods of improving the quality of the coffee exported from Madagascar. In addition to the possibility of growing Arabica coffee there, mention is also made of encouraging results obtained in an attempt to improve the Canephora coffees by crossing *Coffea canephora* with *C. congensis*. The hybrids obtained have grey beans (which can be shelled) and no particular aroma, but they are not bitter and have retained the extremely high fertility of the best Canephora types. One of the best of these hybrids is being further crossed with Congensis to improve the hybrid type even more.
The vast region of Ankaizina could be utilized for the cultivation of Arabica forms and a research station for this crop set up if funds became available.

1080. Frahm-Leliveld, J. A. 633.73:575.127.2:576.356
Nieuwe gezichtspunten voor het selectieonderzoek bij soortskruisingen van koffie naar aanleiding van cytologische gegevens. (**New view-points for research on breeding in the case of species crosses of coffee on the basis of cytological data**).
Bergcultures 1940 : **14** : 380–86.
The role of cytological knowledge as an aid in the attempt at present being made in the N.E.I. to breed an Arabica type of coffee, resistant to diseases, suited to low lying plantations (i.e. 1000 metres above sea level), of good quality and high yield is outlined. The well known cytological disturbances that occur on crossing distantly related forms are explained and incidentally the relation between such chromosome irregularities and the occurrence of spongy and round beans is mentioned.
Ring formation and its significance in different varieties and hybrid types of coffee are illustrated. The best types for use in breeding are those in which the amount of ring formation is high and the frequency of division stages showing unpaired chromosomes is low. The effects of back-crossing and similar processes in eliminating defective chromosome pairing in hybrids is exemplified by reference to the crosses Arabica x Congensis 27–02, produced at Djember, Kapakata 1 x Uganda Bgn.1[a] x BP 42 and Kapakata 3 x BP 42. The possible merits of various future breeding material including that recently imported from Africa (cf. "Plant Breeding Abstracts", Vol. X, Abst. 836) are briefly discussed in conclusion.

1081. Gandrup, J. 633.73:581.165.1(92)
Hedendaagsch pionierswerk. (**Modern pioneering**).
Bergcultures 1940 : 312–18.
An account of the work in Soembawa at the Tambora Estate where coffee cultivation is carried on. Selection has already produced the clone "Tambora 1" which appears as though it might rival T.P.21.
Flowering is exceptionally luxuriant and in addition most favourable conditions for fruit setting exist and diseases and pests are very rare with the exception of monkeys which destroy the lamtoro shade trees.

1082. Miranda, S. and
Silva, P. 633.74:581.48:575.242.061.6
Mutações em *Theobroma leiocarpa* Bern. var. Comum. (**Mutations in *T. leiocarpa* Bern. var. Comum**).
Bahia Rur. 1939 : Oct.-Nov.; also Trop. Agriculture, Trin. 1940 : **17** : p. 139.
The mutation referred to resulted in the production of white seed, with some coloured seed presumably as a result of out-pollination. All the flower parts of the mutant are pure white and the fruit is greenish white, ripening yellow.

1083. 633.81

El Linaloé y su aprovechamiento. (**Linaloe and its utilization**).
Méx. For. 1940 : **18** : 53–55.

The plant, *Elaphrium aloexylon*, Schiede (*Bursera aloexylon*, Engl.) which furnishes an essential oil from the wood and fruits, is described. The extraction of the oil, which is used therapeutically and in the preparation of incense, is also described.

1084. 633.821:576.312.35

HUREL-PY, G. 633.821:576.353:576.312.38

Étude des noyaux végétatifs de *Vanilla planifolia*. (**Study of the vegetative nuclei of *V. planifolia***).
Rev. Cytol. Cytophysiol. Vég. 1939 : **3** : 129–33.

The vegetative nuclei of *V. planifolia* belong to the type with prochromosomes (Eichhorn) or euchromocentres (Grégoire and J. Doutreligne). The diploid chromosome number for the plant was found by Hoffmann to be 32, and 28–32 by the writer.
The present paper describes somatic mitosis in nuclei in the aerial roots and the writer concludes that these nuclei behave like typical "prochromosome" nuclei and that some very close relationship exists between chromosomes and prochromosomes.

1085. GYÖRFFY, B. 633.842:576.356.5:577.16:581.04

(**Tetraploid paprika**).
Acta Univ. Szeged. 1939 : **5** : 30–38. [From Züchter 1939 : **11** : p. 312].

Capsicum annuum seedlings treated with colchicine solution gave chimaeras in which the tetraploid sectors were characterized by larger stomata, pollen grains and seeds. From the seeds tetraploid ($2n = 48$) plants were raised which are believed to have a vitamin C content higher than normal.

OIL PLANTS 633.85

1086. ZAGORODNYI, G. P. and
KHARITONOVA, S. M. 633.85:575(47)

(***Xanthium Strumarium* as a new oil plant**).
Proc. Daghestan Agric. Inst. 1939 : No. 1 : 270–76.

The plant gives high yields of seeds, higher even than the sunflower, which contain an average of 34% of oil. Calculated in yield of oil per hectare a yield of 8·5 centners was obtained from *X. Strumarium*, which compares very well with 5·4 for sunflower and 7·0 for *Ricinus*.
The oil has a high specific gravity, in iodine number it resembles linseed, its saponification is high and the extracted seeds have a high content of protein.
The plant is tolerant of saline soils and, being superior to the sunflower as an oil bearer, is thought to be a worthy object for breeding.

1087. 633.854.559:576.312.35

D'AMATO, F. 633.854.559:581.3

Ricerche embriologiche e cariologiche sul genere *Euphorbia*. (**Embryological and cytological researches on the genus *Euphorbia***).
Nuovo G. Bot. Ital. 1939 : **46** : 470–509.

The development of the female gametophyte was studied in a number of species of *Euphorbia* and is described; descriptions are given also of microsporogenesis and of fertilization. The haploid chromosome numbers for the respective species are given as follows: *E. Paralias* 8, *E. pubescens* 7, *E. falcata* and *E. Pithyusa* v. *ovalifolia* 18, *E. Characias* 10 and E. *amygdaloides* 9. The chromosome number 7, reported for the first time, is thought, on the grounds of secondary association, to be derived from the haploid number 6, so that *E. pubescens* is regarded as a secondary polyploid. This species completes the polyploid series 7–14–21–28 now known in the genus.

1088. POTTER, G. F.,
ANGELO, E.,
PAINTER, J. H. and
BROWN, R. T. 633.854.56:581.47:519.24

A statistical study of variation in tung fruits.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 515–17.

In connexion with breeding work on tung trees, samples of fruits were taken from selected

trees and the variance of measurements of transverse diameter and weight of fruit, percentage filling of the nuts and percentage of kernel in the fruit was found for each tree. Wide differences in variability were found.

1089. Angelo, E. 633.854.56–2.111–1.521.6
The breeding and improvement of tung.
Proc. 41st Annu. Conv. Ass. Sth. Agric. Wkrs, Birmingham, Ala., February 7–9, 1940 : p. 162. (Abst.).

Many seedling tung trees appear to be promising as having escaped injury or withstood late spring frosts.

MEDICINAL PLANTS 633.88

1090. 633.885.1:581.165.1:581.165.72(92)
633.885.1:581.143.7
Kinaproeftuin "Cinchona". (**Cinchona Experimental Plantation "Cinchona"**).
Bergcultures 1940 : **14** : p. 322.

The West Java Experiment Station is establishing an experimental plantation for cinchona at Pengalengan where cuttings of recommended clones and seedlings from new combinations of clones are raised.

Part of the land is to be used as a plantation to contain a collection of specimens which will include authentic representatives of the main older Ledgeriana clones, and part as a plantation for grafting material. In the latter plantation cuttings from the most recent clones will be available. Delivery of plant material will begin in 1941.

RUBBER PLANTS 633.91

1091. Schmöle, J. F. 633.912–1.557:581.165.71
De invloed van den onderstam op de productie van oculaties. II. (**The influence of the stock on the production of budgrafts. II**).
Arch. Rubbercult. Ned.-Ind. 1940 : **24** : 305–14.

A record is given of the growth and yield of bud grafts of AV 49 and 50, on seedlings from the AVROS clones Nos 33, 49, 50, 163, 180 and from native rubber plantations, studied from the standpoint of the effect of the stock on performance.

1092. Poddubnaya-Arnoldi, V. A. 633.913:575.127.2:576.354.4:581.162.5
(**Interspecific hybridization in the genus *Taraxacum***).
Bull. Soc. Nat., Moscow 1939 : **48** : 87–98.

A further account is given of the work referred to in "Plant Breeding Abstracts", Vol. X, Abst. 202.

CAMPHOR PLANTS 633.95

1093. 633.956:575(47)
Nilov, V. I. (Editor). 634:575(47)
(**The biochemistry and physiology of southern trees and shrubs**).
Vsesojuznaja Akademija Sel'skokhozjaistvennykh Nauk im. V. I. Lenina. Gosudarstvennyi Nikitskii Botaničeskii Sad im. Molotova (Lenin Academy of Agricultural Sciences, Molotov's Nikita Botanic Garden) Jalta 1939 : **21**: No. 2 : Pp. 176.

The monograph contains a number of articles of which the following are of interest to plant breeders:—

Nilov, V. I., Nesterenko, P.A. and Mikhel'son, L. A. (*Variation in the chemical composition of plants in crosses*). (*pp. 3–28*).

Ocimum canum contains camphor, which is present to the extent of 60% in the oil; *O. pilosum* produces no camphor but its oil contains 40% of citral and also methylchavichol in considerable quantity. Eugenol is also absent in this species, though found in traces in *O. canum*. Both species contain phenols, though of different constitution. Hybrids obtained by crossing these species were vegetatively reproduced so as to give sufficient quantities of oil to be

analysed. The method of analysis is described. The oil of the hybrid contained on an average only 3·77% of citral and 6·9% of camphor, 15% of phenols and 44·9% of methylchavichol. In some of the hybrids there was no citral at all and in a few there was no camphor. The phenols were thus present in higher proportions than in the parents and the methylchavichol was distinctly higher than in *O. pilosum*, which contains a maximum of 40% whilst some of the hybrids contain as much as 76%. The hybrids contained no terpenes of the general formula $C_{10}H_{16}$, which are present to the extent of 35% or more in *O. canum*; sesquiterpenes and higher alcohols on the other hand somewhat exceeded those in the parents.

The absence of citral in the hybrids is explained on the grounds that it is the least complex of all the compounds in question and is therefore in the presence of the necessary enzymes converted into the more complex products: the first of these is camphor, which in the presence of the *O. pilosum* enzymes however tends to be converted into phenols. Methylchavichol and the sesquiterpenes are more complex still and this accounts for their preponderance in the hybrids.

The oil content of the hybrids was intermediate between the parents, the specific weight of the oil and its refractive index (both associated with complexity) were higher than in either parent. It is suggested that if the effect here described occurs also in connexion with growth hormones the phenomenon of hybrid vigour would be explained.

Kniševetskaja, T. I. (*The composition of the essential oil of hybrids of basil*). (*pp. 29–36*).

Ocimum sp. No. 49, containing 65% methylchavichol, 28–30% linalool and 4% of an unidentified phenol in its oil was crossed with *O. canum*, containing 60% of *d*-camphor. Eight plants were obtained and the mixed oil from these contained only 12·23% of camphor and 17·7% of methylchavichol; small quantities of borneol, eugenol and various other compounds were detected but linalool was absent. Borneol is a compound that is not present in either of the two parental species and the inheritance is to be studied in later generations.

Eremeev, G. N. (*Diagnosis of the drought resistance of fruit trees*). (*pp. 63–110*).

One hundred and fifteen varieties of peach, almond, olive, pear and apple were tested and physiological differences between resistant and susceptible varieties are indicated. The evidence based on the behaviour of cut leaves was in agreement with the results of field tests. The most resistant varieties are named.

Sokolova, N. F. (*Resistance of peach and almond to low temperatures*). (*pp. 111–44*).

Observations made on 17 peach and 20 almond varieties showed them to differ in dormancy period, those with the longest rest period being the hardiest.

In breeding for hardiness one of the parents should have a long rest period and the other should have buds capable of withstanding low temperatures.

FRUIT TREES 634

1094. Kalmykov, S. S. 634:575.127

(Extend the use of Michurin's methods in breeding subtropical crops).

Soviet Subtropics 1940 : No. 4 (68) : 26–27.

Inadequate hardiness observed in planting material of a number of subtropical plants including tea, persimmon and tung, is ascribed to the absence of hybridization and growers are advised to use only hybrid material for planting, according to the principles of I. V. Michurin.

1095. Nebel, B. R. 634:581.331.2:581.149:576.356.5

Longevity of pollen in apple, pear, plum, peach, apricot, and sour cherry.

Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 130–32.

While pollen of apples, pears and plums (*Prunus domestica*) appears to have a life of about 4 years under optimum storage conditions (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 874) that of peaches and apricots shows degeneration after 2 years. Sour cherry pollen is viable for 4 years. There thus appears to be a correlation between pollen longevity and high chromosome number.

1096. 634.11(56)
634.13(56)
634.21(56)

Ülkümen, L.

Morphologische, physiologische und befruchtungsbiologische Untersuchungen der wichtigsten Obstsorten von Malatya. (**Investigations on the morphology, physiology and biology of fertilization of the most important fruit varieties of Malatya**).

Arb. Yüksek Ziraat Enstitüsü Ankara 1938 : Heft 65 : Pp. 256.

These exhaustive varictal studies of the apple, pear and apricot varieties of Malatya, in the Euphrates region of Turkey, cover pollen germination and pollination relationships, fruit drop and drought resistance and the morphology of fruit, flowers and leaves.

1097. Lincoln, F. B. 634.11:576.356.5

Chromosome counts on Hibernal and Northwestern Greening apples.

Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : p. 217.

From root tip counts Hibernal and Northwestern Greening were found to be tetraploid ($2n = 68$) and diploid ($2n = 34$) respectively. The variety Sasha (Hibernal x Gravenstein) open-pollinated gave diploid seedlings. Nevis, a variety of *Malus ioensis* and other specimens of this species gave diploid open-pollinated seedlings. From the chromosome numbers of their open-pollinated seedlings Waziya and Wetanka are considered to be diploids and Wecota a triploid. The last three varieties are all derived from the cross Nevis x Northwestern Greening.

1098. Moore, R. C. 634.11–2.452–1.521.6:575.11

A study of the inheritance of susceptibility and resistance to apple cedar rust.

Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 242–44.

The distribution of resistance in progenies of apples suggests that resistance to apple cedar rust is dominant and due to a single factor. On this hypothesis Arkansas Black is homozygous for resistance, Jonathan and Rome Beauty homozygous for susceptibility and Delicious, Ralls Seedling, Winesap and Virginia Beauty are heterozygous.

Different degrees of susceptibility occur among the susceptible varieties and appear to be heritable.

1099. King, J. R. 634.2:575.127.2:576.354.4

Cytological studies on some varieties frequently considered as hybrids between the plum and the apricot.

Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 215–17.

The varieties studied were Rutland, Poe Royal Cotplum, Red Bud, Gustosa, Francis, Apex, Stanford and Apricot-Plum. *Prunus armeniaca* and *P. salicina* were used for comparison. The haploid number was 8 in all varieties. Meiotic irregularities such as lagging and bridge formation were most common in Red Bud and occurred in diminishing degrees in Rutland, Stanford, Apricot-Plum and Gustosa in that order; in the other three varieties and in *P. Armeniaca* and *P. salicina* they were rare.

On the basis of their morphological characters the author speculates on the possible origin of the varieties.

1100. Fikry, A. 634.2–2.6–1.521.6

Nematode disease of stone-fruits.

Bull. Minist. Agric., Egypt 1939 : No. 217 : Pp. 9.

Root-knot disease, caused by the eelworm, *Heterodera marioni* (Cornu) Goodey, is very common on stone-fruit trees, particularly peach, in Egypt. Six different rootstocks have been tested for their susceptibility to this disease. Beladi apricot, Mariana plum and Myrobolan plum are completely immune; *Prunus Davidiana* has a high degree of resistance; but Beladi peach and almond are highly susceptible. Observations have also been made on compatibility between peach scions and various rootstocks.

1101. 634.22:575(79.4)
634.25:575(79.4)

Wight, W. F.

Seven new peaches and a new plum for the Western States.

Circ. U.S. Dep. Agric. 1940 : No. 552 : Pp. 23.

Descriptions are given of the following yellow-fleshed peach varieties, Leeton, Maxine, Penryn,

Nestor, Standford, Ellis and Farida, and of a plum variety, the Padre. The new peach varieties have been selected from more than 280 different varieties produced as the result of the breeding work. All are yellow-fleshed, but they have two very distinct types in their ancestry. One type is represented by the St. John and Early Crawford varieties with comparatively small flowers and the other types by such peaches as the Yellow Transvaal which have comparatively large flowers. Most of the new varieties have been tested only in California.

1102. CRIST, J. W. 634.23:575.247:581.162.5:581.143.26
Twig growth in mutants of Montmorency cherry.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 245–49.

In these further studies of the barren mutant of the Montmorency cherry (cf. "Plant Breeding Abstracts", Vol. X, Absts 215 and 536) the rate of growth in twig diameter was studied. The growth curves of barren and fruitful twigs were similar in type and fitted curves derived from the expression $\log_{10} x/(A - x) = K(t - t_1)$, in which A represents the maximum size attained, t_1 the time at which the size $A/2$ is reached and K is the "velocity constant". The quotient $K/A = k$ is termed the "specific velocity constant" and is considered to be independent of the environment. In the present case K was larger for the barren twigs, but k was smaller.

1103. 634.25:575"793"(74.9)
BLAKE, M. A. 634.25:581.481:581.142
Some results of crosses of early ripening varieties of peaches.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 232–41.

Seedling progenies have been raised from crosses of early peach varieties by removing the hybrid embryos from the stones and culturing them on sterile quartz sand with sugar and nutrient solution. Preliminary data are given in tables, relating to seedlings which fruited in their third year. The object of the work is to breed peach varieties which will ripen in New Jersey between July 1 and August 1.

1104. MEADER, E. M. and
BLAKE, M. A. 634.25:575.127.2
Some plant characteristics of the second generation progeny of *Prunus persica* and *Prunus kansuensis* crosses.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 223–31.

The plant, flower and fruit characters of a selection of 24 F_2 plants from crosses between *P. Persica* and *P. kansuensis* (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1601) are reported. In respect of the different characters studied some plants resembled one parent, some the other, and some were intermediate. Only 11 seedlings have fruited and failure to set appears to be associated in some plants with the presence of small, non-functional ovaries. Flower buds in the F_2 plants were rather susceptible to frost injury but the flowers at anthesis showed considerable frost resistance. The fruit was mainly of poor quality.

1105. LESLEY, J. W. 634.25:581.47:575.11.061.1
A genetic study of saucer fruit shape and other characters in the peach.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 218–22.

F_1 and F_2 results from crosses with the Peento peach indicate that the oblate, saucer-shaped fruit of this variety is governed by a single dominant factor for which Peento is heterozygous. Saucer shape appears to be associated with early maturity and small fruit weight. Seeds from saucer-shaped fruits show very low germination and the character probably could not survive in the wild. It is probable therefore that it arose as a mutation.

1106. RJABOV, I. N. 634.25:582
(Classification of peaches).
Vsesojuznaja Akademija Sel'skokhozjaistvennykh Nauk im. V. I. Lenina. Gosudarstvennyi Nikitskii Botaničeskii Sad im. Molotova (Lenin Academy of Agricultural Sciences, Molotov's Nikita Botanic Garden) Jalta 1939 : Pp. 32.

The merits of previous classifications of peach varieties are discussed and a new classification is then presented, in which the genus *Persica* is divided into species, *P. vulgaris* and *P. ferganensis*, the former being divided into two botanical varieties, and within these a number of geographical groups. A key for the determination of the wild species is also provided.

CITRUS FRUITS 634.3

1107. Wong, Cheong-Yin 634.3:581.162.3:581.163
The influence of pollination on seed development in certain varieties of citrus.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 161–64.

In both seedy and "seedless" citrus varieties open or hand cross-pollination increased to a greater or less extent the number of seeds per fruit, while the parthenocarpic fruits developed in the absence of pollination contained no seeds.

VARIOUS SMALL FRUITS 634.4

1108. 634.451:577.8
Hodgson, R. W. 634.451:581.163
Floral situation, sex condition and parthenocarpy in the oriental persimmon.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 250–52.

In a collection of trees of the oriental persimmon (*Diospyros kaki*) grown at Riverside, California, the flowers were regularly unisexual and the trees could be divided into the following five groups: I, pistillate; II, pistillate, sporadically monoecious; III, monoecious; IV, monoecious, sporadically pistillate or staminate; V, staminate. The first group was much the largest.
Most of the trees produced a proportion of seedless fruits.

1109. Inouye, Y. 634.451:581.481
(**Persimmon with twin fruits**).
Bot. & Zool. 1936 : **4** : 1973–74.

Illustrations of twin persimmon fruits collected in the young stage in the author's garden in 1933.

1110. C. 634.461–1.543.1:575.41(92)
Goed opletten ! (Iets over een krachtig groeiende lamtorosoort). [**Keep a good look out ! (Something about a vigorous species of wild tamarind)**].
Bergcultures 1940 : **14** : 526–27.

A description of a particularly vigorous form of wild tamarind, Lamtoro H.v.T., found by H. A. F. van Toorenenbergen among some trees grown for fencing. Though first regarded as a possible hybrid between acacia and wild tamarind, it has now been shown to be probably a newly discovered variant that has arisen by natural selection. It may prove extremely valuable as a shade tree and at the Central and East Java Experiment Station it has given promising results, its growth being much more rapid and its stem straighter than in the ordinary lamtoro which it also surpassed in the habit of the crown. The amount of seed set was however small.

NUTS 634.5

1111. McKay, J. W. 634.53:581.162.51
Male sterility in Castanea.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 509–10.

Three cases of complete male sterility in the chestnut are described.

1112. Steinbauer, C. E.,
Beattie, J. H. and
Batten, E. T. 634.58:575.42
Influence of mass selection within certain large-seeded Virginia-type peanut varieties.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 685–88.

Mass selection for low and high yield within single plant selections of peanuts were without consistent effect on yield. In this respect therefore the single plant selections behave as pure lines and it is concluded that cross-fertilization and mutation are so infrequent as to have only negligible effects on the genetic stability of single plant lines.

PALMACEOUS AND OTHER TREE FRUITS 634.6

1113. Bondar, G. 634.61:575(81)
O coqueiro (*Cocos nucifera* L.) no Brasil. [**The coconut (*C. nucifera* L.) in Brazil**].
Bol. Inst. Cent. Fom. Econ. Bahia 1939 : No. 7 : Pp. 100.

In the section on botany the main varieties grown in Brazil are briefly described, though it is stated that a great many intermediate forms exist. Full botanical descriptions of the species are also given.

Selection for productivity is effected by choosing individuals with 40–50 branches in the inflorescence, with 4–7 female flowers per branch; the dwarf coconut is especially promising in this respect.

1114. Rževkin, A. A. 634.63:575(47)
(The olive).
Vsesojuznaja Akademija Sel'skokhozjaistvennykh Nauk im. V. I. Lenina. Gosudarstvennyi Nikitskii Botaničeskii Sad im. Molotova (Lenin Academy of Agricultural Sciences, Molotov's Nikita Botanic Garden) Jalta **1939** : **14** : No. 3 : Pp. 40.

This small brochure devoted to the introduction and cultivation of the olive in the Nikita Botanic Garden contains brief sections on cold resistance, drought resistance and oil content and descriptions of the main varieties grown.

Breeding work was started in 1937, when crosses were made with the main object of producing preserving varieties possessed of greater earliness and cold resistance.

1115. Condit, I. J. 634.653:016
A bibliography on the avocado (*Persea americana* Miller).
Citrus Exp. Sta., Calif. 1939 : Pp. 293. (Mimeographed).

A comprehensive bibliography of articles on, or containing references to, the avocado. The references are grouped by subjects and an author index is provided.

SMALL BUSH FRUITS 634.7

1116. Slate, G. L. 634.711:575
Breeding autumn-fruiting raspberries.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 574–78.

The triploid and tetraploid autumn-fruiting (everbearing) raspberries suffer from low fruit quality, the berries being small, crumbly and often with few or no properly developed drupelets, especially in the autumn crop. The triploid variety Erskine Park gave very poor breeding results, male and female sterility being common among its progeny.

The chief value of the variety Ranère in breeding work seems to be to introduce earliness of the autumn crop.

The variety Lloyd George has given promising results in breeding autumn-fruiting raspberries. Some of its seedlings have already been named, as follows, Indian Summer (Seedling N.Y. 1950 x Lloyd George), Marcy (Lloyd George x Newman) and Taylor (Newman x Lloyd George); and even better autumn-fruiting seedlings have been raised from its derivatives crossed among themselves or with other raspberries.

1117. Lewis, D. 634.711:575.116.1:581.331.23
Genetical studies in cultivated raspberries. II. Selective fertilization.
Genetics 1940 : **25** : 278–86.

In the cultivated raspberry there appears to be a gene, *W*, which inhibits or retards pollen tube growth (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1343). Cross-over values between this gene and two marker genes *T* and *G* have now been calculated. Two other genes, *B* and *X* (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1342), are also included in the same linkage group. A chromosome map for the five genes is given.

1118. Colby, A. S. 634.715:575(73)
The Brainerd blackberry.
Amer. Fruit Gr. 1940 : **60** : No. 3 : 11, 35.

The Brainerd blackberry, which originated as a result of crossing the Himalaya with an eastern erect-growing variety (possibly the Georgia Mammoth), is very vigorous and has a very long picking period. It is suggested that its long root system accounts for the long picking season.

1119. KUZMIN, A. I. 634.723:575.127.2:634.725
(The role of the intermediary plant in obtaining the first and the second generation between black-currant and gooseberry).
Proc. Lenin Acad. Sci. U.S.S.R. 1940 : No. 5 : 3–12.
Hybrids between black-currant (*Ribes nigrum* L.) and gooseberry (*Grossularia reclinata* L.) are usually sterile. The first flowers of the hybrid *R. nigrum* x *R. dikuscha* were pollinated with the gooseberry Zelenyi Butyločnyi [Green Bottle], which gave a much greater success than when older hybrids were used. The hybrids so obtained were more vigorous in growth and formed a number of large flowers. Some of the hybrids flowered a second time later in the season. The flowers were pollinated by a mixture of pollen of black-currant and gooseberry, whereby twenty-two berries were obtained from nine hybrids. The berries were small like black-currants and intermediate in flavour; some were seedless but a few contained good seeds resembling gooseberry seeds. From twenty-two seeds only *1* plant ("F_2") was obtained. It had curious elongated buds, very vigorous growth and the characteristic black-currant scent.

1120. DARROW, G. M.,
CLARK, J. H. and
MORROW, E. B. 634.73:575
The inheritance of certain characters in the cultivated blueberry.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 611–16.
Data are given on the fruit size, scar and colour and season of ripening of a number of hybrid progenies of blueberries.

1121. 634.73:575(73)
Blueberries—three new varieties.
Amer. Fruit Gr. 1940 : **60** : No. 3 : 10, 24.
Three new varieties of blueberry which are late in maturing and resistant to cracking in rainy seasons have been bred. The varieties are Atlantic, a cross between Jersey and Pioneer, Pemberton from a cross between Katherine and Rubel, and Burlington from a cross between Rubel and Pioneer. All three are hardy and Pemberton has proved resistant to cold.

1122. MERRILL, T. A. and
JOHNSTON, S. 634.73:581.162.3
Further observations on the pollination of the highbush blueberry.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 617–19.
In the blueberry varieties Stanley, Jersey, Concord and June the set was at least as good and the berries at least as large after hand pollination, with removal of unopened flowers, as after open-pollination.

1123. COE, F. M. 634.75:575(79.2)
Promising new everbearing strawberry originated in Utah.
Amer. Fruit Gr. 1940 : **60** : No. 5 : p. 18.
By crossing Berri Supreme (which is probably the same as P. W. Mammoth) with Rockhill, a private grower has been able to select from the progeny a very good, autumn bearing strawberry which he has called Twentieth Century and which he has now decided to introduce under Plant Patent restrictions.

1124. DARROW, G. M. 634.75:581.48:576.356.5
Seed size in strawberries.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 564–66.
The weight per 100 seeds of a number of strawberry species, varieties and selections is given. Octoploid forms had on the average a higher seed weight than diploids but it was possible to select octoploids with a seed weight as low as the diploid average.

OTHER FRUITS 634.77

1125. GADDINI, L. and
CIFERRI, R. 634.771:582(63)
Il banano nell'Oasi di Derna. **(The banana of the Derna Oasis).**
Relaz. Monogr. Agr.-Colon., Firenze 1940 : No. 59 : Pp. 34.
This illustrated pamphlet deals with the history of the introduction of the banana into the Derna Oasis and describes the two most widespread local races, which belong respectively to the groups *Musa paradisiaca* subsp. *sapientum* and *M. nana*. In addition to their botanical

characteristics, their agronomic features and the biology of flowering in both types are outlined with notes on various aspects of cultivation and on susceptibility to diseases. A bibliography and map are appended.

VITICULTURE 634.8

1126. WELLINGTON, R. 634.835:575

The Ontario grape and its seedlings as parents.

Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 630–34.

Data are given in tabular form on the attitude of the stamens, fruit colour, season and quality of seedlings obtained by crossing Ontario with other grapes. This American grape has given an exceptionally large number of promising seedlings, 12 of which have been named.

As with most American grapes, seedlings obtained by selfing have been very weak. Ontario has yellow fruits, a recessive character; crosses with Moore Early, Mills, Sheridan and Seedling 9549 have given no yellow-fruited seedlings. Good quality is frequently found in seedlings of Ontario.

1127. BRANAS, J.,
BERNON, G. and
LEVADOUX, L. 634.835:575.1(44)

La génétique en viticulture. (**Genetics in viticulture**).

Progr. Agric. Vitic. 1938 : **110** : No. 39 : 1–8; No. 40 : 9–16; No. 41 : 17–24.

The history and development of various genetical theories having been reviewed, their importance for viticulture is made clear. Methods of determining the merits of hybrid vines are discussed as well as the need for genetical study of such material. The ancestry and reputation of various vine hybrids, in which the Teinturier strain of *Vitis vinifera* is present, are referred to; and the Mendelian basis of colour of the juice of the berries in this species is recorded as a genotype in which the Teinturier type is TT, and t_1t_1 the recessive factors for colourless juice, while in the hybrid type Tt_1 the juice is intermediate in colour. In addition to t_1 which is found in the Aramon, Grenache, Morrastel and Piquepoul vines among others, another recessive factor t_2 is postulated for the black Aspiran variety and probably other stocks. The heterozygote Tt_2 would, it is believed, be similar to the TT form and t_2t_2 would be colourless.

The authors' observations on fertility in various hybrids agree with the assumption that vines are fertile or sterile according to whether they bear hermaphrodite or staminate flowers, the former bearing the genetic factor f, the latter F, and the heterozygotes Ff having staminate flowers.

The need for replacing former haphazard methods by systematic experimentation and study of vines in France is emphasized and a list of some good vines obtained by systematic hybridization is given. The production of Berlandieri Riparia stocks for the European types has been a successful step and the development of Berlandieri x Riparia and Berlandieri x Rupestris types may reduce the number of useless stocks in favour of "omnibus" types less selective in their soil requirements. While Solonis (H.N.) has shown a certain resistance to sodium chloride but is susceptible to phylloxera, Solonis-Riparia 1616C is resistant to both salt and phylloxera but grows yellow in chalky soils, and finally 45 E.-M. (Foëx), a Solonis-Berlandieri form has (with certain reservations) none of these defects.

The various characteristics and resistance to diseases and phylloxera exhibited by direct producers in France and their adaptation to soil types are considered and the need for improving their quality by systematic selection and breeding on genetic lines is urged.

1128. SNYDER, E. and
HARMON, F. N. 634.835:575.14

Grape progenies of self-pollinated vinifera varieties.

Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 625–26.

Brief notes are given on progenies raised by selfing different varieties of *Vitis vinifera*. All the parent varieties have upright stamens but they all threw a proportion of seedlings with reflexed stamens, the average proportion being 13·1%. White-fruited varieties produced all white-fruited seedlings, red-fruited varieties gave reds, whites and an occasional black while black-fruited parents gave mostly blacks with a few whites and an occasional dark red. Petit Syrah, with black fruits bred true for fruit colour. There was considerable variation in time of maturity of the seedlings. In general the inbred progenies were similar to their parents in vine and fruit characters and in vigour.

1129. Stout, A. B. 634.835:581.163:575
Progress in breeding for seedless grapes.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : 37 : 627–29.

1130. Olmo, H. P. 634.835:581.163:575.247
Somatic mutation in the vinifera grape III. The Seedless Emperor.
J. Hered. 1940 : 31 : 211–13.

1131. Snow, A. G. (jun.) and [illegible] 634.97.575
Genetics in forestry.
J. For. 1940 : 38 : 404–08.

1132. 634.97:575:48.5
634.972.3:576.356:575
Stady, N.
The Swedish Forest Tree-Breeding Association.
Tidskr. Skogv. 1939 : 47 : 149–60.

1133. ORDING, A. 634.97:575(48.9)
Om vekstforedling av skogstraer i Danmark. Dr Syrach Larsens arbeid i Hørsholm. (**Forest tree breeding in Denmark : Dr S. Larsen's work at Hørsholm**).
Tidsskr. Skogbr. 1939 : **47** : 209–21.

In describing the work at Horsholm Arboretum the importance is stressed of the question of provenance and the value of interracial and interspecific hybrids as a source of fast growing and vigorous trees which may possibly also be resistant to certain diseases. Considerable numbers of progeny from interspecific larch crosses are available for study at Charlottenlund and Hørsholm and the hybrid forms from the Japanese x European larch are larger and stronger than either parent type; some also appear satisfactory in shape with quite good branch formation and may possibly (judging from experiments in Scotland) be also resistant to canker. It is thought that the Japanese x Siberian larch may prove a good combination. The use of artificial and natural pollination is mentioned.
Natural hybrids between the Japanese and European larch are readily distinguishable by their light bark from the Japanese, but not so easily from the European form.
Larsen is also experimenting with alder hybrids and poplar hybrids and the occurrence of tetraploid alders in Denmark is mentioned with reference to Nilsson-Ehle's work on giant aspens (cf. "Plant Breeding Abstracts", Vol. X, Abst. 884).
Work with *Populus vernirubens* Henry is described and also its potential value in Danish and possibly Norwegian forestry.
Vegetative reproduction and techniques used in pollination are discussed, including a method enabling pollination to be carried out in the greenhouse with pollen from various localities, and a technique for inducing precocious flowering of seedlings in pots.

1134. JOHNSON, L. P. V. 634.97:575:016
The breeding of forest trees.
For. Chron. 1939 : **15** : 139–51.

A useful list of titles.

1135. SCHREINER, E. J. and
HUBERMAN, M. A. 634.97:575:581.145.1.02
Induced flowering -a tool for mass selection, progeny tests and forest management.
J. For. 1940 : **38** : 491–92.

Some degree of control of the male parentage of seed of selected trees could be obtained in the case of species which flower only at long intervals if a method could be found of artificially inducing the selected trees to flower when the surrounding trees were not flowering.

1136. 634.97:576.16(48.1)
HEIBERG, H. H. H. 634.972.6:575(48.1)
En oversikt over proveniensproblemet hos våre viktigste skogstraer, furu, gran og bjørk. (**A survey of the provenance problem of our most important forest trees, pine, spruce and birch**).
Medd. Norske Skogforsøksvesen 1937–1939 : **6** : Hefte 20–23 : 51–109.

The problem of climatic races of forest trees has not been investigated to any great extent in Norway. The importance of ascertaining the best races for each locality is now recognized. As regards birch the problem is more of selecting and breeding individual trees of good quality than of selecting climatic races. Preliminary studies of the biology of flowering and the cytology of the birch should precede improvement by individual selection and hybridization.

1137. LANTELMÉ, W. 634.97:581.18:576.16
Phototropismus und Provenance. Ein Nachwort und eine Mahnung zur "phototropistischen Methode" des Herrn Professor Schmidt. (**Phototropism and provenance. A comment and a warning regarding Professor Schmidt's "phototropic method"**).
Allg. Forst- u. Jagdztg 1939 : **115** : 69–85.

In this critical examination of Professor Schmidt's phototropic method of testing the value of forest tree seed the author concludes that phototropism is genetically determined, independent of provenance, not dominant and not correlated with other biologically and economically important characters. The phototropic method will not settle any questions of provenance.

1138. WETTSTEIN, W. von 634.972.3:575.061.1
Die Vermehrung und Kultur der Pappeln. (**The raising and cultivation of poplars**).
Forstarchiv 1939 : **15** : 164–68.

This paper, which deals mainly with requirements and cultivation of poplars, with locality, and with tolerance of species and varieties to different soil types, also mentions individual differences in growth and disease resistance in aspens. Trees have been found whose progeny were to a large extent resistant to fungi attacking at the seedling stage. Also, some progenies develop long, thin, drooping branches in contrast to other progenies which are small but strong and sturdy. The first type tend to become drooping forms in subsequent years. Combinations of particular trees from different areas are very valuable and of use for breeding purposes.

The cultural value of certain varieties is mentioned.

1139. DILLEWIJN, C. van 634.972.3:575.12:576.356
Cytologie en veredeling van *Populus*. (**Cytology and breeding of *Populus***).
Ned. Boschb.-Tijdschr. 1939 : **12** : 470–81. [From Forestry Abstracts, Oxford 1940 : **1** : p. 236].

A preliminary report is given on cytological investigations on *P. nigra* L., *P. nigra* L. var. *italica* du Roi, *P. brabantica* Houtz., *P. gelrica* Houtz., *P. robusta* Schneid., *P. deltoides* Marsh. var. *missouriensis* Henry, *P. serotina* Hartig, and *P. alba* L. *P. nigra*, which is generally considered a pure species, showed, like its variety *italica*, a regular heterotypic and homotypic division. *P. brabantica*, *P. gelrica*, *P. robusta*, and *P. serotina* showed various irregularities characteristic of hybrids. The great number of irregularities which were observed in *P. deltoides* var. *missouriensis* confirmed the view held by some authors that this variety is a hybrid. The specimen of *P. alba* examined proved to be triploid. Secondary association occurred clearly in *P. nigra* and its variety *italica*, and less clearly in the hybrids. In the author's opinion, the genus *Populus* (and possibly also *Salix*) is a secondary polyploid with an original basic number of $n = 8$; of these, 4 chromosomes have been triplicated and the remaining 4 duplicated. The present number of 19 was the result of a fusion of 2 chromosomes within one of the groups of three.

1140. DENGLER, A. 634.975:575.12:581.162.32
Über die Entwicklung künstlicher Kiefernkreuzungen. (**On the development of artificial pine hybrids**).
Z. Forst- u. Jagdw. 1939 : **71** : 457–85. [From Forestry Abstracts, Oxford 1940 : **1** : p. 236].

Observation on 9- to 10-year-old pines resulting from cross-pollination within, or hybridization of, several geographic races grown in Chorin, revealed distinct heterosis in Scotch ♀ x Brandenburg ♂, and better growth in French ♀ x Brandenburg ♂ than in the pure maternal line, while Palatinate ♀ x Brandenburg ♂ and Scotch ♀ x East Russian (Perm) ♂ did not differ in growth from the pure maternal line. Bad stem form in Palatinate pine did not improve by hybridization with Brandenburg pine. The bluish needle colour of the French and the yellowish winter colour of the East Russian appeared in hybrids of French and East Russian maternal parentage respectively, and the yellowish colour also appeared in Scotch ♀ x East Russian ♂. Self-pollination in *montana* and *sylvestris* gave a degenerated descendance in many cases. It was not possible to cross *banksiana* and *sylvestris*, but mutual hybridization was obtained with *montana* and *sylvestris*. The hybrids had the same type of needles and behaved in the same manner towards needlecast as pure *sylvestris*, but their general growth form ranged from typical *montana* shrub to almost pure *sylvestris*.

1141. LANGNER, W. 634.975:575.42:581.143
Züchtung auf Wüchsigkeit. (Theorie einer Auslese als Beitrag zur Forstpflanzenzüchtung). (**Breeding for vigorous growth Theoretical basis of a method of selection as a contribution to forest tree breeding**).
Forstwiss. Zbl. 1939 : **61** : 313–18.

The existing method of selecting mother trees by tests of the vigour of their progeny could be improved by eliminating the variable factor of seed size at the seed bed stage. Before being

sown the seed could be divided into different lots according to size, so that differences in the growth of the seedlings in each lot undergoing selection will correspond more closely to their hereditary qualities.

VEGETABLES 635

1142. Tatebe, T. 635.15:581.43:575.11.061.6
(Inheritance of root color in the radish).
Bot. & Zool. 1936 : **4** : 1385–92.

The author postulates the following genotypes for the different root colours: purple, $R^p R^p yy$; red, *RRyy*; yellow, *rrYY* and white, *rryy*. R^p, *R* and *r* form a multiple allelomorph series and red or purple is epistatic over yellow.

1143. Yamaguti, Y. 635.46:575.11.061.1:581.46
(On the inheritance of the anomalous "tomoe" shape of flower in *Portulaca grandiflora*).
Jap. J. Genet. 1939 : **15** : 357–58.

The anomaly in question affects the petals which appear as though their right and left sides were rotated in opposite directions, producing an effect like a fylfot, an ornamental device resembling a swastika. The "tomoe" characteristic is only displayed in the later stages of flowering and appears to be affected by temperature and light; genetically it is a recessive conditioned by a single gene (*t*) which segregates independently of the genes *S* and *C* for flower colour.

1144. Jagger, I. C. and Whitaker, T. W. 635.52–2.411.4–1.521.6:575.11 632.411.4:576.16
The inheritance of immunity from mildew (*Bremia lactucae*) in lettuce.
Phytopathology 1940 : **30** : 427–33.

Two European and non-specialized types of lettuce immune from mildew caused by race 5 of *Bremia lactucae* were crossed with commercial varieties of the "Iceberg" type, which are immune to four races of the fungus but are susceptible to race 5. All the F_1 plants were immune to race 5 and the F_2 showed a ratio of 3 immune : 1 susceptible. Resistance to race 5 therefore appears to be controlled by a single dominant gene. Circumstantial evidence suggests that physiological races in *B. lactucae* originate through mutation.

1145. Ware, G. W. 635.615:575(76.7)
The world's largest watermelons.
Market Gr. J. 1940 : **66** : 223–24.

The world's largest water-melons are reputed to be grown in Hope, Hempstead County, Arkansas. The variety grown is Improved Triumph which was obtained by ten years careful selection of the progeny from a cross between a Tom Watson and a large round variety.

1146. Walker, M. N. 635.615–2.484–1.521.6:575(73)
The breeding of wilt resistant watermelons in the south.
Proc. 41st Annu. Conv. Ass. Sth. Agric. Wkrs, Birmingham, Ala., February 7–9, 1940 : 34–35. (Abst.).

The problem of breeding wilt-resistant water-melons involves the consideration of many factors. Among these are the lack of definite immune strains, the occurrence of physiological races of the fungus and the effect of environmental factors on resistance. Resistance must also be combined with the several desirable fruit characters.

1147. Enzie, W. D. 635.62:575(74.7)
The Geneva Delicata squash.
Fm Res., N.Y. St. Sta. 1940 : **6** : No. 1 : 1, 13. [From Exp. Sta. Rec. 1940 : **82** : p. 770].

A short description is given of the development and characteristics of the Geneva Delicata squash, a new form which is mosaic resistant and has excellent baking quality.

1148. CONTARDI, H. G. 635.62:575.22:581.47(82)
Inventario de las variaciones observadas en los frutos de una población de zapallos (*Cucurbita pepo* L.). [**Inventory of the variations observed in the fruits of a population of pumpkins (*C. Pepo* L.)**].
An. Inst. Fitotéc. Santa Catalina (1939) 1940 : **1** : 187–99.
Variation was observed in fruit form, weight, size of cavity, colour of flesh, skin and peduncle, degree and type of wartiness and ribbing, flavour of fresh and cooked fruits and hardness of rind. Selection is being carried out for the most desirable types.

1149. CURTIS, L. C. 635.621:575.125
Heterosis in summer squash (*Curcurbita pepo*) and the possibilities of producing F_1 hybrid seed for commercial planting.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 827–28; also Market Gr. J. 1940 : **67** : p. 312.
The number and the total weight of the early fruits produced by the F_1 hybrid between Connecticut Straightneck No. 10 and Early Prolific Straightneck were more than twice as great as the parental values. Since the squash is monoecious it therefore appears that there are commercial possibilities in the utilization of hybrid vigour. F_1 seed has been produced in bulk in an experimental half-acre crossing plot in which alternate rows were emasculated and kept for seed.

1150. INOUYE, Y. 635.63:575.061.6
(**More cases of anamorphosis**).
Bot. and Zool. 1936 : **4** : 2139–40.
Among the anomalies recorded are a white cucumber which was found among a number of Umagome half-white and on being crossed with Chinese Long Green gave a plant with a partly yellow-green and partly white fruit.
Instances are also given of (1) failure of double fertilization in the persimmon and (2) the transformation of stamens into pistils in *Andropogon Sorghum*. In the latter case grains were nevertheless formed.

1151. HUTCHINS, A. E. 635.63:575.11
Inheritance in the cucumber.
J. Agric. Res. 1940 : **60** : 117–28.
The genetics of eighteen characters has been studied in the F_1 and F_2 progenies of a cross between two inbred cucumbers. Single factor differences were found for determinate growth habit *v.* indeterminate, black *v.* white spines, coarse *v.* fine spines, few spines *v.* numerous, mature fruit netting *v.* no netting, and tall plant *v.* dwarf. Mature fruit colour could be explained by the interaction of two factors, orange and yellow being dominant to cream and the combination of orange and yellow producing red. Data are also given for the inheritance and interaction of the quantitative characters such as number of fruits, average fruit weight, weight of mature fruits per plant, time of flowering (for both male and female flowers) and number of laterals per plant.

1152. MILLER, J. C. and
MIKELL, J. J. 635.64:575.116.1
Linkage studies of certain characters in tomatoes.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 884–85.
In a cross between the tomato varieties Marglobe and Louisiana Slicer the normal height of Marglobe was dominant over the extreme tallness (long internodes) of Louisiana Slicer. Similarly the round fruit shape of Marglobe was dominant over the oblong fruit shape of Louisiana Slicer. Monohybrid ratios of 3 : 1 were obtained in each case in the F_2 but the dihybrid segregation showed an excess of parental combinations and it was calculated that the two factor pairs are linked with a cross-over value of 21·5%.

1153. WHALEY, W. G. 635.64:575.125:581.145
The relation of organ size to meristem size in the tomato.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 910–12.
The F_1 hybrids *Lycopersicon esculentum* x *L. pimpinellifolium* and *L. esculentum* var. Chinaman x *L. racemigerum* exceeded the parental values for height, fresh weight, fruit number per

plant and fruit weight per plant but were intermediate in respect of average fruit weight and corolla size. The size of the determinate organs, flower and fruit, do not therefore appear to be affected by hybrid vigour.
The volumes of the apical meristems of mature hybrid embryos and of 63-day-old hybrid seedlings were intermediate between the respective parental values, indicating that the size of the determinate organs is dependent on the size of the meristem from which they are produced and also that hybrid vigour is not related to meristem size.

1154. 635.64:582
MULLER, C. H. 635.64:581.9
The taxonomy and distribution of the genus *Lycopersicon*.
Nat. Hort. Mag. 1940 : **19** : 157–60.
The genus *Lycopersicon* is divided into two subgenera, *Eulycopersicon* with red fruits and *Eriopersicon* with green fruits. An expedition to South America has shown that the green-fruited group, which contains four species, is confined to western South America and that the red-fruited group, which consists of the two species *L. esculentum* Mill. and *L. pimpinellifolium* (Jusl.) Mill., is also concentrated in these regions. The red-fruited species, particularly *L. esculentum*, are found wild, however, also in western South America and in Central and North America, in which places they were probably introduced and have since escaped. The wild form of *L. esculentum* is the variety *cerasiforme* (the Cherry tomato), which differs from the cultivated type in being a smaller plant and having much smaller fruits.

1155. TATEBE, T. 635.646:575.11.061.6
(On inheritance of color in *Solanum melongena* Linn.).
Jap. J. Genet. 1939 : **15** : 261–71.
The characters of the varieties of egg plant used in this study are as follows:—Hakata-naga, Oserikawa and Tsuda-naga have dark purple plant colour, light green fruit flesh, dark purple fruit skin, except under the persistent calyx where it is light green, and violaceous corolla; Hetamuraski has the same colours except that the fruit skin under the calyx is purple; Aonasu has green plant colour, light green fruit flesh, green fruit skin, light green under the calyx and white corolla; Kanto-ao has light purple plant colour, light green fruit flesh, green fruit skin, light green under the corolla, violaceous corolla; Buko-haku has light purple plant colour, white fruit skin and flesh and violaceous corolla.
The following factors are proposed to explain the segregations obtained in hybrid progenies: *P*, a dominant for the production of dark purple fruit skin and violaceous corolla; *G*, a dominant producing green fruit skin and light green flesh; *D*, a dominant producing dark purple fruit skin; *Pc*, a dominant causing the dark purple produced by *P* and *D* to extend under the persistent calyx. *P* and *D* are complementary factors for the production of dark purple fruit skin.
Aonasu, Buko-haku and Kanto-ao fruits all gave the characteristic flavone reaction to ammonia fumes and are therefore credited with a factor *C* controlling the production of a flavonal chromogen. No varieties lacking this factor are mentioned.
Dark purple plant colour was dominant over both green and light purple plant colour, giving 3 : 1 segregation in each case.

1156. INOUYE, Y. 635.646:581.481
(Twin fruits of egg-plants).
Bot. & Zool. 1936 : **4** : 1644–46.
On twin fruits of various types in the egg plant.

1157. KUTZ, A. L. 635.651–1.524:582(47)
[Broad beans (*Vicia Faba* L.) of the Daghestan mountains].
Proc. Daghestan Agric. Inst. 1939 : No. 1 : 131–79.
Characteristics of the flower, pod, seed, leaf, stipules, stem and root are considered as well as biological characters such as vegetation period, flowering and ripening. A natural hybrid between *V. Faba* var. *minor* and *V. Faba* var. *major* has been discovered and is described. The various cultural measures are also described.

1158. Ekinci, A. S. 635.652(56)
Systematische und morphologische Untersuchung der Bohnenrassen und-sorten der Türkei. (**Systematic and morphological investigation of the races and varieties of the beans of Turkey**).
Gartenbauwiss. 1940 : **14** : 358–432.
The object of the work was the standardization of as many as possible of the varieties of beans (*Phaseolus*) grown in Turkey. In all the author recognizes and describes 33 different types.

1159. Rietsema, C. 635.652:575(49.2)
De boonenteelt. (**Bean growing**).
Meded. Tuinbouw-VoorlDienst, 's Grav. 1939 : No. 13 : Pp. 32.
This illustrated pamphlet summarizes existing information on bean cultivation in Holland including sections on the choice of varieties; selection; pollination and methods of artificial crossing; characteristics of different *Phaseolus vulgaris* varieties, such as shape of pods, seed colour; number of pods on the inflorescence; plant height, stringlessness, etc.
For the data on inheritance of pod characters (including stringlessness) Becker-Dillingen's work is referred to and Joosten's conclusions on the variability of stringlessness within and between different varieties are cited. Though the mode of inheritance is still unknown the condition seems very probably to have an anatomical basis and there are two distinct types of anatomical structure, which appears to be correlated with variations in the degree of expression of the stringless condition. The heterozygotes range from stringless to very pronounced stringiness. According to Becker-Dillingen the stringless, selected varieties are in many cases more delicate, yield less and have smaller pods. Moreover, the stringless strains are later than others. Dutch breeders recognize the stringless types by their blunted or curled tips.
Discussing the differences in various types and varieties of beans as regards susceptibility to diseases caused by fungi (including the different physiological races of *Colletotrichum*), mosaic, etc., the pole, runner types are stated to be less resistant and therefore less popular than the dwarf forms.
The rest of the pamphlet deals with Dutch varieties, cultural measures and mosaic and bacterial disease (due to *Phytomonas medicaginis* and methods of combating them.

1160. Magruder, R. and
Wester, R. E. 635.652:581.162.32
Natural crossing in lima beans in Maryland.
Proc. Amer. Soc. Hort. Sci. (1939) 1940 : **37** : 731–36.
The amount of natural crossing in lima beans at Beltsville, Maryland was studied using the characters vine habit *v.* bush habit and coloured seed *v.* colourless seed as markers. Recognizable hybrids in the progeny of individual bush, colourless-seeded plants varied from 0 to 82·9%, the variation being probably due partly to differences in the availability of foreign pollen and partly to family differences. Bearing in mind the cross-pollinations which could not be detected, the authors conclude that natural crossing seems to be the rule rather than the exception in the material they studied.
Humble bees were the most prevalent and active of the insect visitors likely to cross-pollinate the flowers.

1161. Murphy, D. M. 635.652–2.8–1.521.6:575(79.6)
State bean improvement program produces new resistant variety.
News Lett. Coll. Agric. Univ. Idaho 1940 : **23** : No. 4 : p. 1.
A new variety of bean, Great Northern U.I. 15, which is resistant to common bean mosaic disease and curly top, has been selected from a cross of Great Northern U.I. 1 (resistant to mosaic) and Common Red Mexican (resistant to curly top).

1162. 635.655:575(76.2)
York, H. A. 635.655.00.14
Growing soybeans.
Miss. Fm Res. 1939 : **2** : No. 6 : 3–5; No. 7 : 3–5.
An account of soya bean breeding at the Delta Branch Experiment Station is given (cf. "Plant Breeding Abstracts", Vol. X, Abst. 914). Another section of the article describes the origin and varietal characteristics of twenty-three named varieties of soya bean grown in Mississippi and the yields of some of the varieties are given in a table.

1163. Bremer, A. H. 635.656:575.11–181:581.47
Sukkererter med store skolmer. (**Sugar peas with large pods**).
18. og 19. Arbeidsåret Meld. St. Forsøkstasjon Grønsakdyrk. Kvithamar i Stjørdal, Oslo (1937–1938) 1939 : G38–42.

A comparison of various Norwegian and other varieties of peas shows that the tall types are earlier and better yielders than the early dwarf and that forms such as Tidleg Sabel with yellow seeds (Bremers), Tidleg Sabel with green seeds (Berles), Norrlands Sugar Pea and Rembrandt combine high yields with large pods.

Numerous trials have been carried out during the past 10 years in Norway with varieties of sugar peas with large pods including snap sugar and snap sugar marrow fat types from France and Holland. The Swedish variety Kongsert represents a successful pure line selection from the French variety Crochu Roi.

Venners Horticultural Experiment Station at Berg has been engaged in breeding a dwarf snap sugar pea since 1928 from a cross between Crochu Roi des Gourmands and a dwarf marrow fat sugar pea. The F_2 (obtained in 1930) indicated that the desired combination of the characters short internode and snap can only occur in the double recessive. By line selection with this dwarf snap sugar pea type a dwarf snap marrow fat sugar pea has been produced and has undergone tests in 1936 and 1938 with other sugar pea types. Other competitors with which the new form was to be tested in 1939 were the Swedish tall snap sugar pea Apollo and the dwarf Olympia and the Finnish medium tall Suomi variety.

BOOK REVIEWS

SAUNDERS, A. R. 519.24

Statistical methods with special reference to field experiments.

Sci. Bull. Dep. Agric. S. Afr. 1939 : 2nd ed. No. 200. Pp. 112. 4 figs. 72 tables. Price 1s. 0d. (Pl. Ind. Ser. 48).

Since the first edition of this bulletin in 1935 (cf. "Plant Breeding Abstracts", Vol. VI, p. 449), the most important advances in field experimentation would appear to be the quasi-factorial and incomplete-block designs of Yates. An account of these designs and results of experiments using them have been added in this second edition. Dr F. Yates has read the manuscript and in a foreword hopes that readers of the bulletin will be encouraged to make a serious trial of the new methods. In addition, the treatment of other topics such as regression has been enlarged on that given in the first edition. As in the first edition, the value of the bulletin largely lies in the many examples of actual experiments at Potchefstroom which are fully worked out arithmetically. A concluding section of the bulletin is devoted to the practical details of field plot technique. There is a bibliography of 112 references and an appendix of statistical tables.

TINTNER, G. 519.24

The variate difference method.

Principia Press, Inc., Bloomington, Indiana 1940 : $2.50. Pp. xiii + 175. 5 figs. 48 tables. (Cowles Commission for Research in Economics Monograph No. 5).

If experimental records are taken at regular time intervals, or generally if data are arranged in order of time, we have to analyse what is called a statistical "time-series". As an example we may quote annual records of the growth of trees (e.g. rubber trees) or meteorological data (e.g. records of rainfall, etc.). It is customary to analyse such series into two component parts—the "systematic part" (which may be a general trend, an average growth curve, a seasonal curve or a cycle) and a "remainder", which is caused by short-period disturbances. The statistical technique customary in this country is to represent the systematic part by a smooth curve which is fitted to the data. The method (for the case of fitting polynomials) is described by R. A. Fisher in his well-known paper *The Influence of Rainfall on the Yield of Wheat at Rothamsted.*

G. Tintner in his new book gives a complete account of an alternative method of dealing with such time-series (called the "Variate Difference method"), which is used mainly in economic researches on the Continent and in the United States. This method consists of taking differences between consecutive observations and then continuing this process of differencing to produce what are called the higher order differences of the time-series. Through this process the "systematic part" is eliminated and the high order differences reflect the effect of short-period disturbances only. One of the difficulties of using these differences is that they are no longer independent statistical quantities and therefore standard tests of significance are not applicable. The author shows how this difficulty may be overcome by a selection process which sacrifices an appreciable amount of the information contained in the original series. Further disadvantages of using variate differences of biological series are considerable. To name only two of them, firstly the method does not give any information on the nature of the systematic part, and secondly, the high order differences are very sensitive to small experimental inaccuracies and such effects may easily be confused with genuine short-period disturbances. H. O. H.

575:633(54)

Agriculture and animal husbandry in India 1937–38.

Imp. Coun. Agric. Res. 1940 : Pp. iii + 416. tables + pls. Price 9s. 3d. (Published by the Manager of Publications, Delhi).

In this comprehensive account of agriculture and agricultural research in India during 1937–38 there are two sections which are of considerable interest to plant breeders and geneticists. In Chapter II, "Economic work on crops", there are reports on variety trials, on the introduction and spread of new varieties and on plant breeding work in progress. The crops dealt with include rice, wheat, cotton, sugar cane, jute, other fibres, tobacco, oil-seeds, tea, coffee, rubber, fruits, fodder crops and grasses, millets, other cereals, potatoes, beans and pulses. Also for many crops details are given of varieties resistant to insect pests and fungous diseases.

The other part of the report which is of interest to plant breeders and geneticists is section 3 of Chapter V, "Plant breeding and genetics". Points of genetical interest are reviewed here and the crops treated include cotton, wheat, rice, millets, sugar cane, potatoes, oil-seeds (linseed, *Brassica* spp.), groundnut, castor, coconut, barley, gram, pigeon-pea and sunn-hemp. The work described includes genetical studies, cytological investigations, interspecific crossing, studies on hybrid vigour, the production of polyploids and the induction of mutations by X-rays.

575.113

WADDINGTON, C. H. 581.3

Organisers and genes.

Cambridge Biological Studies. University Press, Cambridge 1940 : 12s. 6d. Pp. x + 160. 15 figs. 2 pls.

The science of genetics, which is one of the branches of experimental biology that has made the most rapid advances in the last quarter of a century, is also the most precise. Yet the exact nature and mode of action of the gene remains a problem, the solution of which will only be made possible when the findings of cognate branches of biology are brought to bear upon it. Dr Waddington is one of those who have done most in linking up genetics with the recent work on developmental embryology and his present summing-up of the position will be welcomed by workers in both fields.

The first part of the book is devoted to an account and discussion of the action of organizers in the development of vertebrate embryos. This is followed by a discussion of the nature of the gene and of its action. The scheme of development arrived at on consideration of the embryological data proves to be closely analogous with that based on the study of the gene. In each case the organism is faced at intervals with the possibility of development in two or more different directions and both genes and organizers are shown playing the role of the decisive agent, either as an external stimulus, or as a directing influence from within. In most normal genotypes the alternatives are sharply contrasted but in many mutant types the sharpness of the alternatives is blurred. Cases are cited in which the action of a gene is known to be through its effect on the organizer or organizer system, and this effect can sometimes be imitated by the action of chemical agents, such as dilute poisons, for instance.

Dr Waddington's discussion definitely brings us one stage nearer an understanding of the mechanism of genic action. The book is of the high standard associated with the Cambridge University Press, though neither the text nor the bibliography is entirely free from minor typographical, orthographical and grammatical errors.

MEYER, B. S. and
ANDERSON, D. B. 581.1

Plant physiology. A textbook for colleges and universities.

Chapman and Hall, Ltd, London 1940 : 24s. 0d. Pp. x + 696. 151 figs. 60 tables.

Plant physiology is a large subject and it is, of course, impossible to treat every topic in great detail in a single volume of reasonable size. In this book the authors have attempted to give a comprehensive account of the fundamental facts and principles of the subject rather than to present an encyclopedic compilation of undigested facts. They have certainly succeeded in producing a very readable and comprehensive account of plant physiology for the general student. There are also good accounts of those principles of physics and chemistry necessary to the student for a complete understanding of the subject, and those details of plant anatomy that have an important bearing on parts of plant physiology are discussed and illustrated. At the end of each chapter there are discussion questions, suggestions for collateral reading and a selected bibliography. The selected bibliographies might be useful for informing research workers where they could find information on special physiological problems.

FASSETT, N. C. 582(73)

A manual of aquatic plants.

McGraw-Hill Publishing Company, Ltd, London 1940 : 26s. 0d. Pp. vii + 382. illus.

The aim of this book is to make possible the identification of aquatic plants both in the vegetative condition and when flowering and fruiting. Only plants in the north-western quarter of the U.S.A., i.e. from Minnesota to Missouri and eastward to the Gulf of St. Lawrence and

Virginia, are considered. The aquatic plants included are those "that may, under normal conditions, germinate and grow with at least their bases in the water and are large enough to be seen with the naked eye". The latter part of this definition restricts the plants described in this book nearly entirely to flowering plants. The book consists of two parts—a General Key of 35 pages and a Descriptive Treatment of 332 pages. By means of the General Key an unknown specimen can be placed occasionally in the proper species but usually only in the correct genus or family. The procedure is then to find the genus or family in the Descriptive Treatment where further keys are given enabling the specimen to be referred to the correct species. More than half of the Descriptive Treatment section consists of full pages of figures of the plants and these would appear to be very useful in helping and confirming the identification of a specimen. There are also appendices on the "Use of aquatic plants by birds and mammals" and on "The relation of plants to fish", a glossary and an index. The production is of the usual high standard now expected in a McGraw-Hill book.

MacEwan, J. W. G. and
Ewen, A. H. 63
General agriculture.
Thomas Nelson and Sons, Limited, Toronto and London 1939 : Pp. x + 345. illus.

In this text book of general agriculture intended for young people pursuing a general education in Canada, the authors cover in 339 pages the whole of Canadian agriculture and also many of the basic principles of botany and zoology. Among the subjects treated in the 24 chapters are soil, tillage, plant life, grain plants, forage plants, roots and tubers, fruits, weeds, plant diseases, insect pests of crops, breeds of farm animal, nutrition, feeding, and management of live stock. It can thus be seen that the treatment of any single topic must be very concise. The facts given, however, appear to have been well chosen and to give a very good outline of the theory and practice of agriculture in Canada. There are a number of good illustrations, but more illustrations would have made a book so full of facts more attractive to the general student.

63.00.15(66)
Third West African Agricultural Conference (held in Nigeria, June 2–25, 1938) Vol. 1 : Pp. 519 + 125 + 12.

Third Conference of West African Agricultural Officers (held in Nigeria, June, 1938) Vol. 2 : Pp. 90.

The volumes under review form a record of the conference of agricultural officers of Nigeria, the Gold Coast and Sierra Leone held in 1938. Dealing with the most varied aspects of tropical agriculture, they are of absorbing interest to all concerned with this subject. Volume 1 contains the papers read and those of direct interest to plant breeders are summarized below. In Volume 2 the proceedings at the conference are reported.

A most important recommendation by the conference concerns the division of major agricultural research work between West African Colonies. It is recommended that the work on cacao should be allocated to the Gold Coast, that on oil palms to Nigeria and that on rice to Sierra Leone. The conference was not satisfied that the time was ripe for the publication of a West African agricultural journal, but urged the necessity of publication of results and provision of facilities for this. Other recommendations dealt with the programme of the new Gold Coast Cacao Research Station, at Tafo. It is recommended that this should be the main cacao research station for West Africa, that it should undertake the introduction of selected material and all new work on the breeding or selection of cacao.

It is not possible here to deal even briefly with the many lines of work covered by the conference, but it should be pointed out that they are not without interest for the plant breeder, e.g. the question of quality in cacao and the agricultural co-operative societies. A characteristic feature of West African agriculture is that it is predominantly small-scale farming by natives. This has important implications for the research worker, as is shown in the case of cacao; it is considered too difficult for native farmers to propagate cacao vegetatively and improved planting material must be distributed as seed. This will obviously affect radically the plant breeding work with cacao. In this connexion the conference recommends that cacao research workers at Trinidad should press forward with work on inheritance through the seed.

Volume 1 is in three parts, containing papers from Nigeria, the Gold Coast and Sierra Leone respectively and the parts are paginated separately.

Smith, E. H. G. — *Nigeria. Cotton selection in Southern Nigeria.* (*pp. 57–59*).

Ishan A was obtained by selection from material of a variety of *Gossypium barbadense* obtained from the Ishan Division of Benin Province and is now almost exclusively cultivated, the exception being a so-called "native" cotton (*G. peruvianum*) which persists in certain more remote districts where there is a local weaving industry. Ishan A is outstanding in resistance to diseases and pests and has a high ginning percentage. While the measurable characters of the lint are good, its only defect is rough or coarse lint.

Breeding work at Ibadan is devoted to maintaining pure seed supplies of Ishan A and to improving the lint quality by back-crossing Ishan A and Sea Island hybrids with Ishan A. From second back-crosses some promising cottons have been obtained but progress is slow in view of the great caution needed in replacing such a satisfactory variety as Ishan A.

Smith, E. H. G. — *Nigeria. Citrus selection in Southern Nigeria.* (*pp. 75–84*).

Work with citrus fruits in Nigeria, the main centres being Moor Plantation, Ibadan and Agege, mainly consists of introduction, observation, multiplication and stock trials. A list of introductions is given in an appendix.

Mayo, J. K. — *Nigeria. Résumé of botanical work carried out in the Northern Provinces.* (*pp. 103–20*).

After a brief account of climatic conditions, the work on different crops is described.

Cotton breeding is done at Maigana and Samaru in Zaria Province. The original cotton grown before British occupation, Gwundi (*Gossypium peruvianum*), has been replaced by Allen, introduced in 1912–13 by P. H. Lamb from Uganda. Numerous other varieties have been introduced and most of them have been discarded. By selection from Allen a line, D31, has been produced with a higher yield but suffers from low lea strength. By further selection two strains have been obtained from D31 giving yarn only slightly weaker than standard. Their yields have yet to be tested over a period of years. Another strain obtained by selection for yield is E31, which gives good yields, yarn as strong as standard and being extremely hairy it is immune to jassid and leaf curl, but is marred by the presence of a dead seed with unthickened hairs in nearly every lock. It is being kept for possible use in crossing.

Two strains selected from the guinea corn variety Farafara (*Sorghum guineense* var. *involutum*) and derivatives reselected from them have given contradictory results in yield trials and it is suspected that hybrid vigour plays a part in the yield of sorghum in Northern Nigeria.

By single plant selection from the local upright variety of groundnuts two superior strains with yields about 10% above any other type have been obtained. One of these has been named Castle Cary and although a sample sent to the United Africa Company was pronounced inferior in oil and protein to ordinary "Niger Nuts" the author maintains that it is at least as good as the ordinary crop and that the analysis claimed for Niger Nuts is too high.

A cowpea (*Vigna unguiculata*) variety introduced from Nyasaland was found to be mixed for seed colour and was purified by selection. Strains derived in this way have proved much higher yielders, both of seed and hay, than the local cowpeas.

Introduction and observation work has been carried on with grasses, lucerne and other leguminous forage plants, *Mucuna aterrima*, *Phaseolus lunatus*, *P. helvolus*, soya beans, pigeon pea, green gram (*Phaseolus aureus* or *P. Mungo*), sweet potatoes and citrus fruits.

Trotman, A. E. — *Nigeria. Ishan cotton seed multiplication.* (*pp. 169–71*).

The Ishan strain of cotton is maintained by single plant selections made every year, multiplied under supervision in the Meko district. The procedure is described.

West, J. — *Nigeria. The control of leaf curl of tobacco in Southern Nigeria.* (*pp. 205–06*).

Inter alia it is mentioned that a collection of local varieties of tobacco is being studied with a view to isolating strains resistant to this virus disease, though so far no promising material has been found.

Gibberd, A. V. — *Nigeria. Review of farm work at Agege.* (*pp. 221–25*).

The work at Agege farm includes individual tree recording of a plot of pure Robusta coffee obtained from Buitenzorg, Java.

A plot of Gbanja kola has been raised from a self-pollinated white kola selection on Moor Plantation to demonstrate the influence of seed selection on cotyledon colour in the progeny; if out-pollination from red trees in the neighbourhood is not serious the trees will be individually recorded and used as a source of planting material. A plot of oil palms has been established from inbred seedlings from parents including the principal types of palms found in Nigeria. Considerable variation occurs in the progenies. The trees are being recorded individually with a view to using seed for propagation and distribution. A plot of cacao has also been raised from inbred seedlings. In mosaic trials with cassava, the Botanist's hybrid selections have exhibited a high degree of resistance.

West, J. — *Nigeria. The development of cacao selection in Nigeria.* (*pp. 367–76*).

After a brief review of the earlier work (cf. "Plant Breeding Abstracts", Vol. VII, Absts 463 and 464) the plantings made with selected material are described. These amount to 14,668 plants of which 13,675 have been produced by self-fertilization and 993 by cross-fertilization of the original 19 selected trees. The plantings are distributed over three farms and selfed progenies from different trees (or if necessary from different pods) are to be compared with each other and with cross-fertilized progenies.

Williams, T. L. — *Gold Coast. Progress made in the production of varieties of cassava resistant to mosaic disease.* (*pp. 45–60*).

The virus disease of cassava known as mosaic has been present in the Gold Coast Colony for many years and has spread rapidly in recent years. Breeding resistant, immune or tolerant varieties was started in 1933. A collection of local and imported varieties has been assembled, classified and used in breeding. A key to the main groups of varieties is given.

The local variety Calabar Long Period has been much used as a male parent, being highly resistant, though it produces long, very woody tubers.

The technique of crossing is relatively simple, as the flowers are monoecious. A silk bag is used for isolation and is removed three days after pollination. Fruits which set are surrounded with a small net bag in case they split and shed the seeds. The percentage set of fruit and seeds is characteristic of the variety. The seeds appear to have a period of dormancy and germination is greatly increased by laying them in moist sand in boxes covered with glass and exposing to the sun. In this way 40% germination was obtained. Statistical data on pollination results with different varieties are given.

In testing for mosaic resistance the seedlings are planted with alternate rows of infected material and those showing any signs of attack at the end of the season are discarded. Cuttings of the survivors are sent to other stations for further testing in the second year and at the same time they are tested for hydrocyanic acid content and for palatability. In the third year the seedlings are again tested for mosaic resistance and in the fourth year there are yield tests of the best seedlings.

Of the seedlings first tested in 1933-34, two have been selected for further trial, C50 and C282A. These have a reasonably low mosaic infection, are both tolerant of mosaic and have a low hydrocyanic acid content. C282A has good palatability while C50 is doubtful in this respect. These two strains at the time of writing were being tested for yield against standard varieties and re-tested for infection. From later series of seedlings some have been free from infection at all stations and certain of these are promising in other respects also.

The incidence of the disease varies according to locality and season and there are also differences in the reaction of the same strain at different places: it is possible that there are different strains of the mosaic virus.

Some of the parent varieties used have a dangerously high content of hydrocyanic acid, but the results obtained so far suggest that seedlings obtained by crossing them with varieties with a low and therefore safe content are themselves safe.

The palatability tests are conducted by agricultural students belonging to different tribes and the results usually agree. Some varieties however are more suitable for certain methods of preparation than for others.

No vegetative or floral character has been found associated with resistance. No correlation has been found between resistance and purple petioles or glabrous young leaves. The ordinary, gradually acuminate leaf lobe is dominant in F_1 over rounded leaf tip.

Wright, J. — *Gold Coast. Notice concerning the central cocoa research station at Tafo, Gold Coast.* (*pp. 65–67*).

A brief account is given of the situation and programme of the new station. In addition to the central station, branch stations have been or are being established in 15 selected localities in the Gold Coast cocoa belt. Selection work, including studies in compatibility, is contemplated, though it is considered as of less immediate importance than problems relating to the conservation of humidity, shade trees, windbreaks, hedges and mulch.

Shepherd, E. F. S. — *Gold Coast. Cocoyam root rot in the Gold Coast.* (*pp. 83–86*).

It is mentioned that future work on the control of this disease, the cause of which is unknown, will include testing the resistance of imported varieties of *Xanthosoma* and *Colocasia* and possibly the breeding of resistant varieties. Such varieties have been sought in the past but without success.

Shepherd, E. F. S. — *Gold Coast. Tobacco leaf curl.* (*pp. 87–89*).

In addition to the virus disease, leaf curl, the author has investigated an abnormality in which the leaf curls towards the dorsal side and enations are produced on the lower surface. This was not transmissible by grafting but reappeared in the progeny of the affected plant and is believed to be hereditary.

It is mentioned that attempts at Amani to obtain strains resistant to the leaf curl virus were unsuccessful, though the South African variety Sterling seems to have some resistance.

Posnette, A. F. — *Gold Coast. Self-incompatibility in cocoa (Theobroma cacao).* (*pp. 90–99*).

Data are presented to show that self-incompatibility causes low yields. Self-incompatibility is least frequent in Amelonado (Forastero) trees, most frequent in Cundeamor and intermediate in Criollo and as regards yield Amelonado is the highest, Cundeamor the lowest and Criollo intermediate. Cundeamor is an intermediate type being probably the result of crossing between Criollo and Amelonado trees.

In general, self-compatibility or incompatibility is not influenced by the age of the tree or by season.

Two cases have been found in which young, self-compatible water-shoots have arisen on old self-incompatible trees. These are believed to be due to bud mutation.

To explain the results of different types of double pollinations the author suggests that incompatible pollen grains release an inhibitory reaction which affects compatible as well as incompatible pollen tubes. More evidence is needed, however, before this can be accepted definitively.

Deighton, F. C. — *Sierra Leone. Oil-palm breeding in Sierra Leone.* (*pp. 8–9*).

Nigerian oil palms are not being used in breeding work at Njala, because no Nigerian palm has given as good a yield as those selected at Calabar in Nigeria and it is not considered necessary to duplicate Nigerian breeding work in Sierra Leone.

Consistently high yields have been obtained from six Angolan palms and the best of these, a thin-shelled type, has been selfed, using cellophane bags.

Some Deli palms, the progeny of selected trees in Sumatra, have made strong growth but given disappointing yields. A few, however, have given very high yields and it is proposed to begin breeding from them.

The native strains of oil palms at Njala have given poor yields of poor quality fruit and no breeding from these trees is contemplated.

Naumov, N. A., Geschele, E. E. and Shitikova-Roussakova, A. A. 632.452:633.1

(The rusts of cereals in the USSR. A monographical study). Sel'khozgiz, Moscow and Leningrad 1939 : 18 roubles 50 copecks. Pp. 402. 64 figs + tables.

The monograph gives a very full account of the cereal rusts in all their main aspects. It includes chapters on physiological specialization, on varietal differences in reaction and on breeding for resistance; this contains a brief outline of the work done in various parts of the world on the inheritance of resistance, of the methods of estimating resistance, of multiplying

the products of breeding and of creating conditions of intensive infection for testing on a field scale.

The monograph terminates with a very full bibliography, covering 55 pages, which includes both Russian and international literature.

MARTIN, H. 632.9

The scientific principles of plant protection with special reference to chemical control.

Edward Arnold and Co., London 1940 : 22s. 6d. 3rd ed. Pp. x + 385. 1 table.

The publication of a third edition so shortly after the second (cf. "Plant Breeding Abstracts", Vol. VII, p. 121) indicates the popularity of this well-known book. The plan of the book has not been changed but it has slightly increased in size and has been revised, though the revision does not appear to have affected the chapter on plant resistance.

HOLMAN, H. J. 632.951.1

A survey of insecticide materials of vegetable origin.

The Imperial Institute, London 1940 : 3s. 6d. Pp. viii + 155. tables.

In view of the widespread interest in British and other colonial countries, the Imperial Institute has rendered a valuable service in producing this monograph on the plant insecticides. It is one of the results of the activity of the Consultative Committee on Insecticide Materials of Vegetable Origin, a sub-committee of which assisted the author in the production of the book.

After a brief introduction the book is divided into five parts, dealing respectively with alkaloid-containing materials, plants containing rotenone and allied compounds, pyrethrum, quassia and plant oils. Most attention is given to nicotine, *Derris*, *Lonchocarpus* and pyrethrum, information being given on botany, chemistry, action on insects and higher animals, use, production and trade. A list of 372 references is provided but there is no index. Brief references to plant breeding work appear throughout the text.

On page iv "*Nicotiana glauca*" should read "*Nicotiana rustica*".

HILGENDORF, F. W. 633.11(93.1)

Wheat in New Zealand.

Whitcombe and Tombs, Limited, London 1939 : 3s. 6d. Pp. ix + 134. illus.

The aspects of the New Zealand wheat crop dealt with in this handy little book by the director of the Wheat Research Institute are as follows: history, areas and yields, varieties, cultivation and harvesting, pests and diseases, and utilization. There are also two concluding chapters on methods of wheat breeding and on the work of the Wheat Research Institute. In appendices are given the wheat statistics of New Zealand since 1851 and a list of references. A short index is provided. The book has been written with the needs of the farmer in mind, but it is not without interest for research workers.

663.4
632.422.3
633.16:581.6

HIND, H. L. 633.79

Brewing science and practice. Vol. II. Brewing processes.

Chapman and Hall, Ltd, London 1940 : 56s. 0d. Pp. xiv + 507–1020. 64–220 figs. 151–254 tables.

Volume I of this work was reviewed in "Plant Breeding Abstracts", Vol. IX, p. 147. Volume II, dealing with brewing processes, is of less direct interest to the plant breeder, though there is a reference to that most esoteric branch of plant breeding, the production of pure cultures of yeast.

Broadly speaking the volume deals with the production, composition, boiling and cooling of wort and with fermentation systems, equipment, microbiology and biochemistry. The chapter on bacteria is by J. L. Shinwell. There are name and subject indexes and lists of references at the end of each chapter. The superb photographs with which the volume is lavishly illustrated include some very striking ultra-violet photographs of yeasts.

A third volume on bottling will complete this monumental work, which seems likely to become a standard text-book and reference work on brewing.

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Abst. 724, line 5 *for* "31–40" *read* "31–32"

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